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FIGHTING WITH THE AIR: AIRPOWER, VIOLENCE, AND PUBLIC SENTIMENT IN IRREGULAR WARFARE

by

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December 2016

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What are the impacts of airstrikes on civilian sentiment and political violence? With increased air campaigns and technology proliferation in the Middle East and Africa, there exists a significant gap exploring airstrike associations within irregular warfare. In response, this thesis uses new geospatial measurements to map civilian sentiment in Yemen. Then, spatiotemporal windows are utilized to assess associations between airstrikes, sentiments, and political violence. The findings imply that airstrikes are associated with an increase in extreme sentiment—for both states, and for insurgencies—suggesting that airstrike effects mobilize bystanders to participate in the political process. Furthermore, the findings indicate that airstrikes raise the level of post-strike political violence in Yemen and Pakistan, but may decrease post-strike political violence in Afghanistan and Somalia. This gives credence to the theory that narrative distribution may be a critical link that connects secondary airstrike effects with policy goals within the human domain. In addition, information asymmetry between competing narrative campaigns and civilians may be a viable theory to connect extreme sentiment and political violence.

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What are the impacts of airstrikes on civilian sentiment and political violence? With increased air campaigns and technology proliferation in the Middle East and Africa, there exists a significant gap exploring airstrike associations within irregular warfare. In response, this thesis uses new geospatial measurements to map civilian sentiment in Yemen. Then, spatiotemporal windows are utilized to assess associations between airstrikes, sentiments, and political violence. The findings imply that airstrikes are associated with an increase in extreme sentiment—for both states, and for insurgencies— suggesting that airstrike effects mobilize bystanders to participate in the political process. Furthermore, the findings indicate that airstrikes raise the level of post-strike political violence in Yemen and Pakistan, but may decrease post-strike political violence in Afghanistan and Somalia. This gives credence to the theory that narrative distribution may be a critical link that connects secondary airstrike effects with policy goals within the human domain. In addition, information asymmetry between competing narrative campaigns and civilians may be a viable theory to connect extreme sentiment and political violence.

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LIST OF ACRONYMS AND ABBREVIATIONS

AMISOM	African Union Mission in Somalia
AQAP	al-Qaeda in the Arabian Peninsula
AQY	al-Qaeda in Yemen
COIN	counterinsurgency
DOD-CIA	Department of Defense-Central Intelligence Agency
FATA	federally administered tribal areas
GRAP	Global Research and Assessment Program
ISAF	International Security Assistance Force
MISO	military information support to operations
NATO	North Atlantic Treaty Organization
NPS	Naval Postgraduate School
OEF	Operation Enduring Freedom
OSS	Office of Strategic Services
UN	United Nations
USAF	United States Air Force
USSOCOM	United States Special Operations Command
VSO	Village Stability Operations

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I. INTRODUCTION AND BACKGROUND

A. INTRODUCING THE STUDY

Since the turn of the century, the use of aircraft in irregular warfare has evolved in both complexity and importance. Multiple contributing factors increase this trend's importance including airpower derived human rights violations, deception campaigns, and third-party influences. Although these factors are not novel, upsurges in technology proliferation have lowered the entry cost for using aircraft at war and increased the salience of airpower debates.[1] Air warfare is no longer conducted only on the sanitized battlegrounds of Apulia, or the bi-state skies above Kursk.[2] The air battle is now over the preverbal urban landscape, where disparate actors—and a multitude of motives—battle among a civilian populous. Using the Middle East as just one example, Russian and Syrian air forces are bombing civilians to quell a rebellion; the Islamic State, a quasi-governmental insurgency is launching drones against coalition forces; and 12 allied air forces are attempting to employ airpower among a continually growing civilian air fleet.[3] The impact of competing goals and alliances inhibits the ability for a no-fly zone and forces civil, military, and insurgent aircraft to operate in the same sky.[4] As a result, the complexity of irregular warfare—often wholly navigated by ground forces—has extended to forces in the air.[5] However, despite the growing complexity and importance of airpower in irregular warfare, academic studies have been slow to respond, resulting in only a few dedicated yet conflicting empirical studies.

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[1] Patrick Tucker, "ISIS Has a Drone Strategy Too," *The Atlantic*, October 18, 2016, http://www.the atlantic.com/technology/archive/2016/10/anti-drone/504479/.

[2] Both the battle of Cannae and the battle of Kursk were conventional force on force engagements. Both are used as historical case studies for traditional warfare, and notably, both battles are void of the influence of civilian populations on the battlefield.

[3] "Operation Inherent Resolve: Targeted Operations against ISIL Terrorists," October 12, 2016, http://www.defense.gov/News/Special-Reports/0814_Inherent-Resolve; "ISIS Now Weaponizing Drones in Syria," October 12, 2016, http://nypost.com/2016/10/12/isis-now-weaponizing-drones-in-syria/.

[4] Kristina Wong, "Petraeus: "'It's Not Too Late' for a No-Fly Zone in Syria," The Hill, September 29, 2016, http://thehill.com/policy/defense/298641-petraeus-its-not-too-late-for-a-no-fly-zone-in-syria.

[5] For an excellent primer on the growing complexity of irregular warfare, read Frank G. Hoffman, "Complex Irregular Warfare: The Next Revolution in Military Affairs," *Orbis* 50, no. 3 (2006): 395–411, doi: 10.1016/j.orbis.2006.04.002.

In addition, states are increasingly turning to aircraft to coerce civilian populations through airpower, as depicted in the Syrian government's bombing of hospitals and United Nations (UN) convoys.[6] These horrific campaigns against civilians, compounded by Syria's use of chemical weapons, such as mustard gas, are raising debates over U.S. intervention.[7] However, diplomatic attempts to influence norms concerning the use of aircraft in irregular warfare have not resulted in beneficial change.[8] Compounding these issues, U.S. attempts at using influence operations to spur civilian *buy-in* have been met with Russian counter-influence. For example, when the United States claimed to have killed the top ISIS spokesman; soon after, Russia claimed to have eliminated the same individual.[9] Although it might be possible to achieve coercive aims without changing sentiment, U.S. campaigns have rarely resorted to such indiscriminant violence.[10] Ultimately, the assumption that airpower can affect public sentiment has not yet been corroborated by statistical analysis.

Heuristic studies attempting to explain airpower effects often assume a correlation between airstrikes and negative sentiment toward a local state, especially when civilian

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[6] Roy Gutman, "Assad and Putin's Sick Strategy Bombing Hospitals," *The Daily Beast*, July 27, 2016, http://www.thedailybeast.com/articles/2016/07/27/assad-and-putin-s-sick-strategy-bombing-hospitals.html; Erin Cunningham, Karen DeYoung, and Andrew Roth, "U.N. Suspends Aid Convoys in Syria after Deadly Attack on Relief Shipment," *Washington Post*, September 20, 2016, https://www.washingtonpost.com/world/end-of-syria-cease-fire-marked-by-new-offensive-and-bombing-of-aid-convoy/2016/09/20/92ae ad0c-7eb7-11e6-ad0e-ab0d12c779b1_story.html.

[7] Krishnadev Calamur, "The Letter Urging a U.S. Rethink on Syria," *The Atlantic*, June 17, 2016, http://www.theatlantic.com/news/archive/2016/06/state-department-syria-letter/487511/.

[8] Somini Sengupta, Michael R. Gordon, and Anne Barnard, "John Kerry Urges Grounding of Military Aircraft in 'Key Areas' of Syria," *New York Times*, September 21, 2016, http://www.nytimes.com/2016/09/22/world/middleeast/john-kerry-syria.html.

[9] Merieme Arif, Holly Yan, and Jim Sciutto, "U.S. Doubts Russia's Claim It Killed ISIS Spokesman," *CNN*, August 31, 2016, http://www.cnn.com/2016/08/31/middleeast/isis-leader-killed/index.html.

[10] For an example of studies into indiscriminate violence, reference J. Lyall, "Does Indiscriminate Violence Incite Insurgent Attacks?: Evidence from Chechnya," *Journal of Conflict Resolution* 53, no. 3 (June 1, 2009): 331–62, doi: 10.1177/0022002708330881.

casualties are reported.[11] However, given the proliferation of unmanned and aerial technologies, it is difficult for the civilian population to identify precisely the actor using military aircraft.[12] As demand for sales of both unmanned and manned aircraft grows incrementally, so too does the multitude of new and revived air forces.[13] With the increase in global air forces comes a corresponding increase in diametrically different opinions on the strategy and use of bombs. Whereas civilian populations may have understood the actor and cause of bombing campaigns in the past, anticipation of targeting techniques is no longer viable due to the great expanse of actors and causes. For example, a Houthi rebel takeover of a Yemen government airfield led to the involvement of multiple air forces from the United Arab Emirates, United States, and Saudi Arabia.[14] Houthi rebels were subsequently able to co-opt a portion of the government pilots to fly rebel-bombing missions.[15] With the total number of dissimilar air forces in the country rising to five, sentiment in response to airstrikes has been more complex than a simple negative correlation for the state. To date, too little is known about airstrikes and public sentiment and too few studies have systematically examined possible associations. Therefore, empirical studies on the spread of sentiment for state and non-state actors—

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[11] Andrew Terrill, "Drones over Yemen: Weighing Military Benefits and Political Costs—ProQuest," *Parameters* 42/43.4/1 (Winter 2012/2013): 17–23, http://search.proquest.com/openview/5070543c08d40d 570f5e208b56cf304f/1?pq-origsite=gscholar; Sudarsan Raghavan, "In Yemen, U.S. Airstrikes Breed Anger, and Sympathy for Al-Qaeda," *Washington Post*, May 29, 2012, https://www.washingtonpost.com/ world/middle_east/in-yemen-us-airstrikes-breed-anger-and-sympathy-for-al-qaeda/2012/05/29/gJQAUm KI0U_story.html; Koen Stroeken, *War, Technology, Anthropology* (New York: Berghahn Books, 2011), 21.

[12] Yara Bishara and Megan Specia, "The Anatomy of an Airstrike," *New York Times*, September 28, 2016, http://www.nytimes.com/video/world/middleeast/100000004676894/the-anatomy-of-an-airstrike. html.

[13] Courtney Howard, "Global Military Aircraft Market to Grow from $61 Billion to $87 Billion," Intelligent Aerospace, April 9, 2015, http://www.intelligent-aerospace.com/articles/2015/04/global-military-aircraft-market-to-grow-from-61-billion-to-87-billion.html; "Global Military Drones Market Shares, Strategies, and Forecasts 2016–2022—Research and Markets," August 17, 2016, http://www.pr newswire.com/news-releases/global-military-drones-market-shares-strategies-and-forecasts-2016-2022---research-and-markets-300314730.html.

[14] Jethro Mullen, "Why Is Saudi Arabia Bombing Yemen?," *CNN*, March 26, 2015, http://www.cnn. com/2015/03/26/middleeast/yemen-saudi-arabia-offensive-why-now/index.html; Thomas Gibbons-Neff and Missy Ryan, "U.S. Special Operations Force Extends Yemen Mission against Al-Qaeda," *Washington Post*, June 17, 2016, https://www.washingtonpost.com/news/checkpoint/wp/2016/06/17/u-s-special-operations-forces-shift-to-long-term-mission-in-yemen/.

[15] Farea Al-Muslimi, "Yemen Air Force Falls into Grip of Houthis," *Al-Monitor*, April 29, 2015, http://www.al-monitor.com/pulse/originals/2015/04/yemen-houthis-air-force-al-Qaeda-advance.html.

within this unique irregular warfare context—are necessary to sharpen the debate on associations of positive or negative sentiment after airstrikes.

Irregular warfare is often referred to as a fight for influence over a population.[16] If sentiment were indeed impacted by airstrikes, then hypothetically a correlation between civilian sentiment and the organizational goals of an insurgency would exist. Some dedicated empirical studies do exist on airpower effects vis-à-vis insurgent goals focusing on positive or negative correlations with political violence, as measured by individual violent events conducted by a political organization.[17] However, other metrics, such as insurgent size and finance levels, would be potentially stronger measurements of effectiveness. Unfortunately, a gap exists concerning available quantitative datasets to measure finance and insurgent troop size. Even so, this thesis theorizes that insurgents conduct information operations to enhance their organizational goals. For example, insurgent desires to manipulate public opinion have led to near-real time distortions of airpower effects, particularly for U.S. operations. This impact is so profound that security studies experts Thomas Rid and Marc Hecker observe insurgents have leveled the playing field with their exploitation of information technology using mass media.[18]

As has been the case in segments of Yemen, Somalia, Afghanistan, and Pakistan, airpower is often used in austere locales where insurgent groups have monopolies on information. These monopolies allow insurgents to falsely inflate civilian casualties directly and build support for their narratives.[19] Moreover, insurgent effectiveness at managing technological innovations ensure that even in populated areas, insurgents are

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16 "Annex 3-2 Irregular Warfare," 5–6, July 12, 2016, https://doctrine.af.mil/DTM/dtmirregularwarfare.htm.

17 Jason Lyall, "Bombing to Lose? Airpower and the Dynamics of Coercion in Counterinsurgency Wars" (unpublished, Yale University, April 6, 2014), 16–18; Patrick B. Johnston and Anoop K. Sarbahi, "The Impact of U.S. Drone Strikes on Terrorism in Pakistan," *International Studies Quarterly*, January 4, 2016, 6, doi: 10.1093/isq/sqv004.

18 Thomas Rid and Marc Hecker, *War 2.0: Irregular Warfare in the Information Age* (Westport, CT: Praeger, 2009), 2.

19 "Why Drones Work: The Case for Washington's Weapon of Choice," November 30, 2001, https://www.brookings.edu/articles/why-drones-work-the-case-for-washingtons-weapon-of-choice/.

often more adept than the United States at building narratives in response to airstrikes.[20] These examples show a concerted effort by insurgents to control information regarding airstrikes and raise the importance of a statistical study. Therefore, a quantitative analysis is necessary to determine the interplay among airpower, sentiment, and insurgent effectiveness as measured by political violence.

1.   Purpose and Scope

This thesis takes up the challenge of measuring the effects of airstrikes on public sentiment and political violence. More specifically, this thesis first measures associations between airpower and the spread of sentiment in Yemen in 2014. Then, it provides further clarity on the relationship between airpower and the spread of violence by conducting a statistical study of airstrikes across multiple countries between 2002 and 2016. Statistical models used to examine the impact of airstrikes and political violence cover Afghanistan, Pakistan, Yemen, and Somalia. Ultimately, this study aims to enhance policy and planning within the complex battlespace of irregular warfare when using airpower.

Attempts at correlating airpower, sentiment, and political violence are subject to the following assumptions and limitations. First, previous studies have lost academic impact due to their lack of replicability. Replication issues exist for various reasons including the close hold of classified information and the academic's choice to use non-open source replication files.[21] Therefore, this study uses open-source media reports of airstrikes and replicable code to ensure transparency and replicability. However, when using open-source media reporting of airstrikes, these sources may contain an inherent selection bias and the potential for false claims. In response, this thesis uses statistical regressions as a baseline to help offset any systemic errors that exist, as well as any individual reporting errors. In addition, this thesis cross-references two openly available

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[20] To explore thoughts on the failure of U.S. narratives, read Amy Zalman and Jonathan Clarke, "The Global War on Terror: A Narrative in Need of a Rewrite," *Ethics & International Affairs* 23, no. 2 (June 1, 2009): 101–13, doi: 10.1111/j.1747-7093.2009.00201.x.

[21] A third reason for the lack of replicability could be that the author is intending to publish the findings in a book, and as such, must keep files on hold until publication. Reference the website www.jasonlyall.com for Lyall, "Bombing to Lose?."

datasets to create a new and highly detailed database of airstrikes, using the same analytic methodology to assess political violence across four separate countries.

2. Research Questions

This thesis posits that irregular warfare—heavily influenced by the human domain—will experience distinct effects in regions with higher levels of airstrikes. Therefore, regarding airpower's role in irregular warfare and the corresponding public sentiment, this thesis attempts to answer the following questions:

1. To what extent does airpower affect popular sentiment and political violence in irregular warfare?

2. To what extent do the effects of airstrikes on political violence differ across campaigns?

3. To what extent do airstrikes increase or decrease the level of local support for insurgent organizations or the existing state?

B. LITERATURE REVIEW

1. Historical Synopsis

The first combat use of airpower is said to be by Italian Captain Carlo Piazza who flew reconnaissance missions in Libya on October 23, 1911.[22] Warfighting airpower was born inherently irregular, as it was the first of its kind. Its irregular use was highlighted by the Italian innovation of leaflet drops, aerial reconnaissance, radio communications, and night bombings.[23] From the onset, irregular warfare commanders, such as T. E. Lawrence, used the new technology for supporting armored cars and for inserting agents.[24] Conventional airpower theorists, such as Gulio Douhet, Billy Mitchell, and Hugh Trenchard, supported airpower's use for control of civilian populations. These initial zealots postulated that the *people's will* could be dominated by the destruction of

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[22] John O'Connell, *The Effectiveness of Airpower in the 20th Century: Part One* (New York: iUniverse, Inc., 2007), 1.

[23] Steven J. Ayre and Jeremy F. Hough, "Air Power in Irregular Warfare" (master's thesis, Naval Postgraduate School, 2012), 8.

[24] John Arquilla, *Insurgents, Raiders, and Bandits: How Masters of Irregular Warfare Have Shaped Our World*, 56635th ed. (Lanham, MD: Ivan R. Dee, 2011), 170–177.

civilian centers or factories.[25] However, even at this early point in airpower history, an ideological rift on bombing—or kinetic events—began to develop. More specifically, some believed in the power of bombing events alone to control populations; others believed air delivered effects, to include bombing, are only as useful as the narrative it supported.

Irregular airpower proponents in Germany, the United States, and Great Britain grew in both frequency and scope during World War II. Germany in several irregular airpower firsts used dirigibles to dominate a population center from the air instead of bombing it directly.[26] In addition, Germany integrated parachutes and gliders into its army-airpower to insert elite troops behind enemy lines.[27] Meanwhile, the United States built civilian volunteer air forces in China prior to entering the war, thus slowing the Japanese invasion. The U.S. Office of Strategic Services (OSS) used airpower to infiltrate agents behind German lines for sabotage and intelligence gathering. At the same time, the OSS made its first strides with air-centric proxy companies launching covert missions behind Japanese lines.[28] U.S. airpower continued to advance as Jimmy Doolittle showcased the first successful air-centric special operation by successfully bombing the Japanese mainland, critically bolstering U.S. morale. The British, courtesy of Orde Windgate, built a successful surrogate air force in Burma to deliver the Chindits, which developed a deep strike capability for invading behind enemy lines.[29] Even so, the theoretical framework for irregular airpower in the 21st century, along with most of the Allied capabilities, was disbanded upon the cessation of the war. The result was a neglect of irregular airpower study while strategic bombing theory was widely promulgated.

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[25] Giulio Douhet and Charles A. Gabriel, *Command of the Air* (London: Books Express Publishing, 2013), viii–10.

[26] Basil Clarke and Charles Emery Rosendahl, *The History of Airships* (Whitefish, MT: Literary Licensing, 2012), 94.

[27] William McRaven, *Spec Ops: Case Studies in Special Operations Warfare: Theory and Practice* (Presidio, CA: Novato, 1995), 33.

[28] Royal Leonard, *I Flew for China* (Garden City, NY: Doubleday, Dorian and Company, Inc., 1942), 211–236; Robert Lee Scott, *Flying Tiger: Chennault of China* (Garden City, NY: Doubleday, 1959), 21–26.

[29] Arquilla, *Insurgents, Raiders, and Bandits*, 185–187.

Conflicts in Korea and Vietnam saw a development of airpower in irregular warfare for the British and French, but showed regression for the United States.[30] The new United States Air Force (USAF), the main proponent of strategic bombing, exchanged irregular capabilities for nuclear armament and "higher and faster" jets.[31] In this way, the USAF severed interactions with the human domain and focused completely on the attrition of the military, deviating from irregular warfare goals. The British, in contrast, began to recognize and document the limitations of munitions in rural campaigns and new technologies in irregular war.[32] Highly customizable aircraft packages and integration with SOF brought the Mau Mau to their knees and ensured success in Oman.[33] For their part, the French also continued their development by building irregular airpower specialization and maintaining an arsenal of purposefully simple, yet effective, aircraft.[34] Ultimately, the United States refined its ability to strike with precision and destroy adversary aircraft, enabling tactical conventional goals, but failing to increase irregular warfare proficiency.

From 1975 to the end of the century, airpower failures in irregular war were common. In 1980, Operation Eagle Claw, the attempted hostage rescue in Iran, failed in part due to an aircraft collision on a remote runway. Russian counterinsurgency (COIN) in Afghanistan was thwarted by the destruction of their helicopters by the Mujahedeen armed with anti-aircraft missiles. In 1993, humanitarian and protection operations in Mogadishu were disrupted after the loss of 18 U.S. soldiers and two Blackhawk helicopters shot down by militia-men firing anti-tank rockets. These failures showcased the rift that had developed between human domain–centric warfare and airpower

[30] Mark Clodfelter, *The Limits of Air Power: The American Bombing of North Vietnam*, 1st ed. (Lincoln: Bison Books, 2006), 117–146; Edward G. Lansdale, *In the Midst of Wars: An American's Mission to Southeast Asia*, 2nd ed. (New York: Fordham University Press, 1991), 366–374; Andrew F. Krepinevich, *The Army and Vietnam* (Baltimore: Johns Hopkins University Press, 1988), 258–275.

[31] Warren A. Trest, *Air Commando One: Heinie Aderholt and America's Secret Air Wars* (Washington: Smithsonian Books, 2000), 3–5.

[32] Bruce Hoffman, *British Air Power in Peripheral Conflict, 1919–1976* (Santa Monica: RAND, 1989), 104–117.

[33] Michael Ashcroft, *Special Forces Heroes (London: Headline, 2012), Chapter 4; Jeremy Black, Air Power: A Global History* (Lanham, MD: Rowman & Littlefield, 2016), 177.

[34] Mark A. Lorell, *Airpower in Peripheral Conflict* (Santa Monica: RAND, 1989), 7–11.

technologies. More specifically, enhancements in targeting capabilities did not correlate to increases in irregular warfare success when humans were able to exploit kinetic destruction. Whereas the Army developed special operations programs to deal with the human-domain—such as civil affairs, psychological operations, and information operations—the Air Force largely failed to nurture these skillsets.[35]

Since the turn of the century, various new roles for airpower have been tested. In Afghanistan, a Department of Defense-Central Intelligence Agency (DOD-CIA) airpower campaign succeeded momentarily in 2001 but lost momentum by 2013. Israel conducted a limited war in 2006, which began as an isolated airpower campaign; however, failures to stop Hezbollah guerrilla tactics quickly led to augmentation by ground forces. North Atlantic Treaty Organization's (NATO's) 2011 air-centric campaign in Libyan overthrew a dictator but failed to secure lasting peace.[36] Subsequently, in Syria, Pakistan, Yemen, and Somalia, the United States began new campaigns reminiscent of the British in Dhofar and the early years of U.S. intervention in Afghanistan.[37] Airpower and special operations forces (SOF) were requested once again to navigate the complex situations where adversary nation-state and sub-state entities intermingle to attempt to control the populous. Even so, academic studies have yet to uncover governing principles for human domain interactions with airpower.

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[35] The Air Force does have a military information support operations Air Force specialty code; however, they are not inherently organized within special operations (SOF) to deal specifically with the human-domain in irregular warfare. In 1980, the U.S. Air Force did create a psychological operations capability in the EC-130 Commando Solo. However, at the time of this writing, active duty EC-130s no longer exist, and the Guard EC-130s have been reduced to three total. Therefore, the Air Force contains an operational level program but lacks tactical level execution ability and guidance. "EC-130J Commando Solo," January 14, 2016, http://www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104535/ec-130j-commando-solo.aspx.

[36] Robert H. Gregory, *Clean Bombs and Dirty Wars: Air Power in Kosovo and Libya* (Lincoln, NE: Potomac Books, 2015), 207–217.

[37] "Special Operations, Intelligence, and Airpower: A Lethal Triumvirate," September 25, 2015, http://warontherocks.com/2015/09/special-operations-intelligence-and-airpower-a-lethal-triumvirate/.

2.   The Debate over Airpower

Three primary aspects fuel current debates over the use of airpower in irregular warfare. First, the choice to use airpower either exclusively or in partnership with SOF in the Middle East and Africa deviates from large-scale, land-based warfare tactics by the United States.[38] U.S. defense leaders have scrutinized these tactics primarily because of a lack of measurable progress and an increase in perceived retaliatory terrorist attacks.[39] For example, the offender who conducted the Orlando shooting in June 2016 cited Pakistan drone strikes as the rationale behind the murders.[40] This explanation highlights an example of attempted manipulation of kinetic effects from air strikes. Second, foreign policy in locations, such as Syria and Libya, are becoming increasingly complex with both local and external air forces.[41] These situations demonstrate the complexity of airpower's effects when targeting options become policy-level discussions. Recent examples include U.S. Department of State pressure on the White House to modify its strategic goals against the Islamic State and directly target the Assad regime.[42] Finally, large-scale civilian casualties, such as those in the Gunship destruction of the Kunduz hospital, or the Syrian targeting of the Aleppo hospital, have concerned citizens and military alike over a lack of retribution when using airstrikes.[43]

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[38] Russell F. Weigley, *The American Way of War: A History of United States Military Strategy and Policy* (Bloomington: Indiana University Press, 1977).

[39] Leigh Ann Caldwell, "John McCain Says Obama's Policies 'Directly Responsible' for Orlando," *NBC News*, June 17, 2016, http://www.nbcnews.com /politics/congress/john-mccain-says-obama-s-polic ies-directly-responsible-orlando-n593951.

[40] "President Obama on the Tragic Shooting in Orlando," June 16, 2016, https://www.whitehouse. gov/blog/2016/06/12/president-obama-tragic-shooting-orlando; Bill Gertz, "Orlando Terror Attack 'Triggered' by Pentagon Drone Strike," Washington Free Beacon, September 28, 2016, http://freebeacon. com/national-security/orlando-terror-attack-triggered-pentagon-drone-strike/.

[41] For a good view of the complexity of the Syrian situation, reference the CNN reporting diagram on the Syrian conflicts multiple players in the article from Joe Sterling, Angela Dewan, and Joshua Berlinger, "UN Chief Calls Convoy Attackers in Syria 'Cowards,'" *CNN*, September 20, 2016, http://www.cnn.com/ 2016/09/19/middleeast/syria-aid-convoys-attacked/index.html.

[42] Calamur, "The Letter Urging a U.S. Rethink on Syria"; David E. Sanger, Mazzetti Mark, and Ben Hubbard, "How a U.S. Airstrike Missed ISIS, but Damaged U.S. Policy in Syria," *New York Times*, September 18, 2016, http://www.nytimes.com/2016/09/19/world/middleeast/us-bombing-syria.html.

[43] "Pentagon Announces Punishments in Deadly Hospital Attack," accessed September 20, 2016, http://www.cbsnews.com/news/us-pentagon-punishment-afghanistan-hospital-attack-kunduz/; Gutman, "Assad and Putin's Sick Strategy Bombing Hospitals."

Within all airpower debates, the asymmetric and destructive capacity of airpower is well known. However, constraints exist—at least in part—because of the lack of knowledge on secondary impacts and effects.[44] More specifically, the follow-on effects of kinetic destruction by aircraft are not well understood and lead to confused and stalled decision making. Recent examples can be seen in the U.S. hesitancy to target internationally condemned actions being conducted by Syria, Iran, and Russia. These situations highlight an inherent bias that kinetic destruction cannot be isolated from violent repercussions. Instead, the fear that public sentiment may reduce legitimacy in the government and destabilize corporate sectors with follow-on political violence is a constant Damoclean dagger. Further studies or examinations of airstrike repercussion on civilians must uncover the truth behind the bias and assist policy makers in deciding when to restrain or release airpower.

3. Theoretical Literature

Winston Churchill famously claimed, "Air power is the most difficult of all forms of military force to measure, or even express in precise terms."[45] This inherent limitation exists in part because of airpower's asymmetric nature and in part because of its continued technological innovations. However, relevant literature dedicated to airpower in irregular warfare can be separated into two major categories, conflicting theoretical literature, and academic discourse on the use of kinetic events. More specifically, conflicting ideas exist on both the use of airpower and the study of how effective airpower has been.

In response to the many dimensions of airpower, classical theory has been dominated by Jominian principles that espouse empirically based attrition and its

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[44] "Then what?" was coined by former CIA Director Petreaus who gave an in-depth discussion on why hesitancy exists within the White House to allow USAF targeting of Syria, Russia, and Iran. As seen in Wong, "Petraeus: 'It's Not Too Late' for a No-Fly Zone in Syria."

[45] Quoted in Andrew G. B. Vallance, "'The Conceptual Structure of Air Power,'" in *Air Power: Collected Essays on Doctrine* (London: Her Majesty's Stationary Office, 1990), 1.

cascading effects.[46] In this vein, Giulio Douhet, Hugh Trenchard, and Billy Mitchell developed the first airpower theories of dominant force to enable destruction of carefully chosen vital points. Airpower within classical theory is singularly sufficient at war. Small differences accentuate classical theorists, as Douhet postulates that bombing urban centers is effective at controlling the will of the populous while Trenchard and Mitchell support bombing factories to build worker trepidation and to crumble the war-making machine. However, these theories ran into issues during World War II when it was observed that the destruction of civilians or their workplaces did not induce fear as hypothesized.[47] In response, subsequent airpower theorists, such as Worden, moved strategic bombing away from attempts to affect the human-domain. Instead, Warden hypothesized that the vital center is not just the civilian populous but five concentric rings, starting with the leadership, and ending with the fielded military.

Additional airpower theories continued the theoretical divide from human-centric and information-centric warfare. Coercive airpower, in an attempt to move away from cascading effects, oversimplified a state's choices to either bombing the military or bombing civilians. Coercive airpower theory then suggests that airpower is best employed to limit the ability of adversaries to accomplish their political goals by using the military.[48] The main proponents of coercive airpower theory include Robert Pape, as well as Byman, Waxman, and Larsen.[49] In short, between two competing political forces, coercive airpower theorizes that kinetic punishment or leadership decapitation is not a viable solution for strategic success in a campaign.[50] Unfortunately, coercive airpower

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[46] Jomini was the premiere example of enlightenment military thought. Although he did not wholly agree to geometric or mathematic warfare, he purposed all strategic warfare could be distilled to principles that were independent of times, place, and the nature of arms. In this way, he focused on the destruction of the enemy's military force through control of centers of gravity in a relatively closed system. Azar Gat, *A History of Military Thought: From the Enlightenment to the Cold War*, 1st ed. (Oxford, New York: Oxford University Press, 2002), 108–137.

[47] Robert A. Pape, *Bombing to Win: Air Power and Coercion in War*, 1st ed. (Ithaca, NY: Cornell University Press, 1996), 52.

[48] Keith Brent, "Proceedings of the 2012 RAAF Air Power Conference: Air Power & Coercive Diplomacy," RAAF Air Power Conference, Australia: RAAF Air Power Development Centre, 2013, 81–89.

[49] Daniel L. Byman, Matthew C. Waxman, and Eric Larson, *Air Power as a Coercive Instrument* (Santa Monica: RAND, 1999); Pape, *Bombing to Win*.

[50] Pape, *Bombing to Win*, 316–317.

oversimplifies the debate by suggesting that bombing civilians and bombing insurgent leadership are equivalent. In addition, it supposes that the only rational for selective targeting is leadership decapitation to punish an adversary. However, recent historical examples have clearly shown that a social network attack can directly bomb insurgents to dismantle a network, and not punish. Even so, the two most prominent theories for the use of airpower distance themselves from human-domain and information-domain concepts.

Issues immediately arise when attempting to marry strategic bombing or coercive bombing theories with irregular warfare goals. Based on Warden's writings, current airpower guidance—even for irregular warfare—advocates for overwhelming force on as many vital centers as possible to provide the cascading effects.[51] However, the human centricity of irregular warfare, and the need to influence the populous, negates a clearly definable vital center. In addition, cascading effects, when in an information dominant atmosphere are subject to bias and interpretation; effects that could equally cascade into mobilization for or against state forces. Insurgents, in contrast, often use non-military means, such as information to accomplish their goals.[52] Therefore, among attrition- and coercion-based airpower theories, a gap exists in academic discourse on irregular warfare. To illustrate, academics, such as Colin Grey, who highlight the importance of strategic bombing, purposefully downplay the role of irregular warfare.[53] Other scholars, such as Robert Gregory, Jr. and Robert Pape, have included irregular wars in their academic studies but have made little differentiation between the irregular and conventional applications of airpower.[54]

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[51] Jason B. Barlow, *Strategic Paralysis: An Airpower Theory for the Present* (Maxwell Air Force Base, AL: Air University Press, 1994), 26–27.

[52] Rid and Hecker, *War 2.0.*

[53] Colin Grey is a proponent of strategic bombing, which led him to the conclusion that because airpower had never been as tactically proficient as in Afghanistan and Iraq, the failure in the years post-2003 only existed because airpower was being asked to partake in a campaign it was not designed for with a lack of operational guidance. As such, airpower can take little blame for the results of an irregular campaign. Colin S. Gray, *Airpower for Strategic Effect* (Maxwell Air Force Base, AL: CreateSpace Independent Publishing Platform, 2012), 238–246; Trest, *Air Commando One*, 11–15.

[54] Pape, *Bombing to Win*, 52; Gregory, *Clean Bombs and Dirty Wars*, 4–15.

4.   Relevant Empirical Literature

A small body of empirical analysis exists by Jason Lyall, Patrick Johnston, and Anoop Sarbahi that focuses primarily on retaliatory terrorism to airstrikes.[55] However, these empirical studies are contradictory, one claiming kinetic strikes have increased retaliatory violence in Afghanistan, and the other claiming kinetic strikes have decreased retaliatory violence in Pakistan. These discrepancies leave a gap in academic studies, but could exist due to data or methodology differences. In addition, discrepancies could exist due to both the type and motif of airpower use. For example, airpower was most commonly used in Afghanistan in a reactive role, reactively supporting Army troops who could not defend with organic support. Pakistan, in contrast, used selective targeting without large-scale ground troop support.

Regrettably, in attempting to distill measurable variables, scholars within the aforementioned camp overly simplify the effects of airpower to increases or decreases in insurgent violence. Measuring insurgent violence in isolation can bring about causal fallacies, primarily in irregular warfare campaigns wherein airpower exists in response to violence, not as a precursor to it. In contrast, researchers, such as Janos Radvani, have shown that violence is only one of several conditions for insurgent effectiveness.[56] Therefore, without a theoretical and tactical understanding of airpower use, many scholars have fallen prey to reverse causation.

It should be noted that a statistical study into the use of indiscriminant violence in irregular—or population centric—warfare does exist. On one hand, the use of indiscriminant violence has been correlated to a decrease in political violence.[57] On the other, indiscriminant violence has been associated with alienating the civilian population.[58] These civilians are repressed from violence only until they find an

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[55] Lyall, "Bombing to Lose? Airpower and the Dynamics of Coercion in Counterinsurgency Wars"; Johnston and Sarbahi, "The Impact of U.S. Drone Strikes on Terrorism in Pakistan."

[56] Janos Radvanyi suggests that spectacular events of violence will increase as an insurgency is building up and also dying. Janos Radvanyi, *Psychological Operations and Political Warfare in Long-Term Strategic Planning* (New York: Praeger, 1990), 130.

[57] Lyall, "Does Indiscriminate Violence Incite Insurgent Attacks?," 349–350.

[58] Sebastian Schutte, "Violence and Civilian Loyalties Evidence from Afghanistan," *Journal of Conflict Resolution*, January 22, 2016, 0022002715626249, doi: 10.1177/0022002715626249.

appropriate avenue to vent their frustrations. Even so, indiscriminant violence is a separate avenue of study, distinct from this thesis looking to understand kinetic strikes in a politically constrained, or limited, environment.

Consolidating the review, U.S. airpower has slowly moved from state and situation appropriate technology, to the broad-brush application of higher, faster, and more accurate aircraft. These aircraft are focused on the destruction of military targets through the use of attrition-based or coercive-based theories. Both major theories fail to address the human-domain or information-domain necessities of irregular warfare adequately. This failure exists, at least in part, because of the lack of empirical analysis on variables outside of direct kinetic destruction. The small amount of analysis that has been conducted exists only to test airpower effects to increase retaliatory violence. Violence, used in isolation, is too shallow a variable to encapsulate the prescribed application of airpower in irregular warfare. Nonetheless, the debate on airpower is consistently increasing, creating an academic gap and a policy need to discuss the interplay between bombs, public sentiment, and political violence.

C.   OVERALL THESIS APPROACH

This thesis uses two studies to determine the level of correlation between airstrikes and sentiment, and airstrikes and political violence. The units of analysis for this thesis are individual geospatial events recorded each day from January 2002 to July 2016. Both studies use advanced statistical regression techniques to assess the relationships between civil conflict, as measured using Uppsalla University's geo-referenced event dataset, and public sentiment, as measured using the report from Yemen program support research. Political violence was recorded per individual event where an attack occurred between a politically motivated group and a state. Importantly, actions from political groups are recorded in the dataset only when the overall threshold of 25 battle-related deaths per year is reached.[59] Air effects are recorded per event that contains at least two reputable media sources reporting the strike.

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[59] Mihai Croicu and Ralph Sundberg, *UCDP GED Codebook Version 2.0* (Sweden: Department of Peace and Conflict Research, Uppsala University, 2015).

When assessing sentiment, this thesis tests the ability of airstrikes to have an enduring temporal effect. Temporal effects are measured by aggregations of airstrikes in various timeframes including days, months, and years prior to the examination, such as the nationwide survey in Yemen. In addition, sentiment changes are measured against regions with higher levels of airstrikes between two separate survey time periods to infer causal direction. For civil conflict, airstrikes are measured against a spatiotemporal window 90 days prior to the event to control for existing levels of violence, geography, economic status, and power relations. Afterwards, political violence trends in the surrounding area are measured to suggest associations between airstrikes and violence.

D.   CHAPTER OUTLINE

This thesis progresses with the following chapters. Chapter II assess associations between airstrikes and sentiment that lays the foundation between objective kinetic destruction and subjective human-domain issues. Chapter III measures associations between airstrikes and political violence, both within and across campaigns. In turn, this measurement ensures that connectivity between sentiment and political violence is explored. Each statistical study introduces the issue at hand, the current discussion, relevant literature, methodology, and results. Finally, Chapter IV contains conclusions, theory development, and recommendations.

II.   AIRSTRIKES AND POLITICAL VIOLENCE

> We are confident that the removal from the terrorist network of this experienced al-Shabaab commander … will disrupt near-term attack[s]
>
> —Peter Cook[60]
>
> Pentagon press secretary on airstrikes in Somalia, June 1, 2016

To what extent do airstrikes in irregular warfare effect levels of political violence? More specifically, do locations directly surrounding an airstrike result in higher levels of subsequent political violence? This chapter traces individually recorded attacks as measured by Uppsala University's georeferenced dataset on violent events, namely, politically motivated attacks by groups that have caused at least 25 battle-related deaths per year.[61] This chapter explores strategic variables that create information asymmetries between a state, a military, and a population, and uses these variables to hypothesize where airstrikes increase or decrease political violence. In this way, the concept of information asymmetry is a uniquely positioned to connect both political extremism and political violence within a limited irregular conflict.

Although statistical airstrike research has focused on policy coercion, campaign duration, civilian casualties, targeted killings, and drone ethics, few studies exist that measure violence in response to airstrikes.[62] Even so, existing studies have developed

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[60] "Statement by Pentagon Press Secretary Peter Cook on U.S. Airstrike in Somalia," accessed November 1, 2016, http://www.defense.gov/News/News-Releases/News-Release-View/Article/788062/statement-by-pentagon-press-secretary-peter-cook-on-us-airstrike-in-somalia.

[61] Croicu and Sundberg, *UCDP GED Codebook Version 2.0*, 15.

[62] Pape, *Bombing to Win*; Michael Horowitz and Dan Reiter, "When Does Aerial Bombing Work? Quantitative Empirical Tests, 1917–1999," *Journal of Conflict Resolution* 45, no. 2 (April 1, 2001): 147–73, doi: 10.1177/0022002701045002001 Todd S. Sechser, "Reputations and Signaling in Coercive Bargaining," *Journal of Conflict Resolution*, June 7, 2016, doi: 10.1177/0022002716652687; Susan Hannah Allen, "Time Bombs Estimating the Duration of Coercive Bombing Campaigns," *Journal of Conflict Resolution* 51, no. 1 (February 1, 2007): 112–33, doi: 10.1177/0022002706296153"; Brett King, "Coercive Airpower in the Precision Age: The Effects of Precision Guided Munitions on Air Campaign Duration" (PhD diss., University of Nebraska, 2014); Jeffrey Scott Bachman, "The Lawfulness of U.S. Targeted Killing Operations outside Afghanistan," *Studies in Conflict & Terrorism* 38, no. 11 (November 2, 2015): 899–918, doi: 10.1080/1057610X.2015.1072390; Jenna Jordan, "Attacking the Leader, Missing the Mark," *International Security* 38, no. 4 (April 1, 2014): 7–38, doi: 10.1162/ISEC_a_00157; Bradley Jay Strawser, *Killing by Remote Control: The Ethics of an Unmanned Military* (United Kingdom: Oxford University Press, 2013).

conflicting results in regards to increases or decreases in violence following airstrikes. Jason Lyall measures post-strike insurgent attacks in Afghanistan and suggests that airstrikes have resulted in net increases in violence against military targets.[63] In contrast, Anoop Sarbahi and Patrick Johnston measure responses to drone strikes in Pakistan finding airstrikes have lowered both overall civilian attacks and attacks on tribal elders.[64] Therefore, research is necessary to resolve discrepancies between airstrikes and political violence studies to uncover whether the differences were due to variances in methodology or in campaigns.

The current chapter aims to resolve the aforementioned statistical issues through variable spatiotemporal windows that measure the number of deaths from individual airstrikes and resultant political violence. Importantly, these measurements are conducted across campaigns from Yemen, Somalia, Afghanistan, and Pakistan from January 2002 to January 2016. However, prior to conducting statistical modeling, applicable literature within the four campaigns is assessed to denote similarities and differences in information asymmetry. Next, the statistical analysis is described in detail to include a new spatial-temporal measurement of airstrike density. Finally, the chapter concludes with hypothesis testing and an interim conclusion.

A.   THE STUDY OF KINETIC EVENTS AND POLITICAL VIOLENCE

This research combines two geo-referenced datasets with a newly coded dataset of airstrikes that increases the locational accuracy and meta-data available for future studies. Building on previous studies, the New American Foundation airstrike dataset—the same used by Johnston and Sarbahi—was used as a baseline to include an additional three years of data. This information was cross-referenced with a separate open-source airstrike dataset from the Bureau of Investigative Journalism and is therefore well positioned to clarify the debate on airstrike effects in irregular warfare.

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[63] Lyall, "Bombing to Lose? Airpower and the Dynamics of Coercion in Counterinsurgency Wars," 2.

[64] Johnston and Sarbahi, "The Impact of U.S. Drone Strikes on Terrorism in Pakistan," 9–13.

1. Air Campaigns and Information Asymmetry in Irregular Warfare

Historical air campaigns among Yemen, Somalia, Afghanistan, and Pakistan are considerably distinct. Each campaign has differing levels of information asymmetry resulting from targeting strategies, as well as sate and insurgent capacities for narrative distribution. George Akerlof first conceived information asymmetry, an economic theory of decision making with incomplete information.[65] Within this theory, rational investors choose between *good* or *bad* products companies based on available information from entrepreneurs.[66] Entrepreneurs, for their part, must successfully pass their message to the investors amidst competition. Information asymmetry arises when entrepreneurs contain more information about the product than investors both for the protection of the entrepreneur and the product.

a. Information Asymmetry and Airpower

This thesis uses the theory of information asymmetry theory as a foundation to explore hypothesis regarding air campaigns. In particular, this chapter argues that a state using airpower holds more information than civilians do on the strategy or *product* of kinetic strikes. Withholding of information exists, at least in part, to protect a state from adverse insurgent actions that may reduce the destructive capacity of its military. For example, a state typically does not broadcast when an insurgent leader is being targeted for fear that the leader will take actions to inhibit the strike. Even so, in irregular warfare, civilians or *investors* are attempting to rationalize whether they see the product as good or bad based on the information available. As seen in Chapter II, airstrikes move bystanders to participants in the political process. Therefore, the state must balance its military's desire for secrecy, and its population's desire for information regarding the product. Insurgencies, must also balance their need for secrecy, due to aforementioned targeting concerns, with their own narrative regarding the airstrikes. In other words, the state and

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[65] George Akerlof, "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism," in *Essential Readings in Economics*, ed. Saul Estrin and Alan Marin (London: Macmillan Education UK, 1995), 175–88, http://link.springer.com/chapter/10.1007/978-1-349-24002-9_9.

[66] Paul M. Healy and Krishna G. Palepu, "Information Asymmetry, Corporate Disclosure, and the Capital Markets: A Review of the Empirical Disclosure Literature," *Journal of Accounting & Economics* 31, no. 1–3 (September 2001): 403.

the insurgents construct competing narratives while seeking to maximize their ability to leverage power.

Two important theories are drawn from merging information asymmetry and irregular warfare information operations. First, mounting evidence states that with effective vertical information, technologies experience a pacification of political violence. Camber Warren suggests that vertical information technologies, such as mass media, were effective in Africa to decrease collective violence.[67] In contrast, horizontal communication technologies, such as social media, may increase collective violence.[68] This finding suggests that in areas where state passage of information to civilians is relatively widespread, state information asymmetry would be considered low and it would be possible to see a lower level of political violence in response to airstrikes. In areas where insurgent passage of information to civilians is widespread, insurgent information asymmetry would be low and increases in political violence may be seen.

Second, information asymmetry when equal between the state and insurgency may increase the level of political violence. Kentaro Hirose, Kosuke Imai, and Jason Lyall suggest that insurgencies target areas of pro counter-insurgent support with violence to insert their own political agenda.[69] If airstrikes are eliciting both government and insurgent extremes support after airstrikes, then insurgents could target this support. In contrast, areas that were usually strongholds of insurgents, when challenged by the state, would be subject to increased attention to hold onto a perceived information dominance by the insurgents.[70] In either case, the perceived or real equivalence of information operations as measured by information asymmetry could hypothetically increase political violence. Therefore, this thesis hypothesizes that when information

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[67] T. Camber Warren, "Explosive Connections? Mass Media, Social Media, and the Geography of Collective Violence in African States," *Journal of Peace Research*, February 11, 2015, 00223433145581 02, doi: 10.1177/0022343314558102, 24–30.

[68] Ibid., 20–21.

[69] Kentaro Hirose, Kosuke Imai, and Jason Lyall, *Civilian Attitudes and Insurgent Tactics in Civil War* (Rochester, NY: Social Science Research Network, 2016), 68, https://papers.ssrn.com/abstract=24461 68.

[70] John J. Mearsheimer, *The Tragedy of Great Power Politics*, 1st ed. (New York: W. W. Norton & Company, 2014), 341–34.

asymmetry for the state is low, and insurgent information asymmetry is high, it is likely to see a decrease in political violence. In contrast, when information asymmetry for the insurgency is low, and state information asymmetry is high, it is likely to see an increase in political violence.

b.   Air Campaigns in Yemen

Yemen's history with airpower has contained several variations of targeting strategies since the turn of the century. After Yemen's first elected president created the fertile ground for corruption, two insurgencies grew in the country, a Shia-based Houthi insurgency called Ansar Allah, and a Sunni based AQAP. In 2013, following the Arab Spring, Ansar Allah began to move against the capital Aden. In 2014, backed by the Government of Iran, the Houthi rebellion captured Aden and massive swaths of Yemen.[71] In response, a Gulf coalition headed by Saudi Arabia and backed by the United States and the United Kingdom was formed to counter the Houthi rebellion and reinstate Yemeni president Mansure Hadi.[72]

Airstrikes in Yemen have taken two interesting routes. First, the United States, since 2007 has been conducting counterterrorism strikes against al-Qaeda, with the aim of minimizing civilian casualties.[73] In contrast, Houthi airpower initially targeted Yemini government vital centers. Soon after, Saudi-led airpower destroyed the Houthi air force began airstrikes to dominate the Houthi rebellion.[74] Once the Gulf airpower team achieved air dominance, massive air campaigns followed a coercive airpower targeting strategy, attempting to limit the military objectives of the insurgents.[75] However, massive

[71] "How the U.S. Became More Involved in the War in Yemen," October 15, 2016, http://www.nytimes.com/interactive/2016/10/14/world/middleeast/yemen-saudi-arabia-us-airstrikes.html.

[72] Simon Tisdall, "Saudi Arabia Campaign Leaves 80% of Yemen Population Needing Aid," *The Guardian*, March 25, 2016, sec. World news, https://www.theguardian.com/world/2016/mar/25/saudi-arabia-campaign-leaves-80-of-yemen-population-needing-aid.

[73] Ibid.

[74] Raf Sanchez and Christopher Hope, "Britain Stands behind Saudi Air Campaign in Yemen Even as Strike on Funeral Prompts U.S. to Review Its Support," *The Telegraph*, 17:49, sec. 2016, http://www.telegraph.co.uk/news/2016/10/10/britain-stands-behind-saudi-air-campaign-in-yemen-even-as-strike/.

[75] "Gulf Coalition Operations in Yemen (Part 2): The Air War," accessed November 3, 2016, http://www.washingtoninstitute.org/policy-analysis/view/gulf-coalition-operations-in-yemen-part-2-the-air-war.

civilian casualties, which were received poorly by the population, resulted from this campaign.[76] Once all overt military targets were hit, which included hospitals and other civilian sites that may hold rebels, the Houthi rebellion continued. Afterward, the Gulf airpower coalition decided to focus on defensive airpower in support of troops on the ground.[77] The combination of several air campaign targeting strategies and a lack of information to the civilian populous on the rationale behind attacks and civilian casualties may have increased information asymmetry between military airstrikes and civilian understanding.

In contrast to state militaries, AQAP and its affiliates have maintained a high level of information operations and have crafted successful narratives in response to military actions. This success showcases two important implications. First, AQAP focused on local-level exploitation, passing information along lines most available to local populations. Second, AQAP narratives not only crafted a believable story but also gave individuals an actionable plan to resolve the local-level grievances.[78] Although the military had also looked to solve local-level grievances, airpower without information operations was seen by many as attacking the structure without understanding the cause.[79]

c. Air Campaign in Somalia

Somalia has long suffered insurgencies and political violence. In the 20th century, the lands of Somalia passed from the British to Italian hands to General Mohamed Siad Barre in the 1970s and 1980s. However, by 1991, civil war ousted Barre, and civil conflict grew to an extent that the UN and United States intervened in December 1992.[80]

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[76] Ben Hubbard, "Airstrikes by Saudi-Led Coalition Kill Dozens in Western Yemen," *New York Times*, October 30, 2016, http://www.nytimes.com/2016/10/31/world/middleeast/airstrikes-kill-dozens-in-western-yemen.html.

[77] "Gulf Coalition Operations in Yemen (Part 2)."

[78] Jennifer Jefferis, "A Fight for Narratives in the Battle against Extremism," *Small Wars Journal*, August 1, 2014, http://smallwarsjournal.com/jrnl/art/a-fight-for-narratives-in-the-battle- against-extremism.

[79] Alistair Harris, "Exploiting Grievances: Al-Qaeda in the Arabian Peninsula," *Carnegie Endowment for International Peace*, *Middle East Program*, 111 (May 2010): 2.

[80] Simon Chesterman, "'Leading from Behind': The Responsibility to Protect, the Obama Doctrine, and Humanitarian Intervention after Libya," *Ethics & International Affairs* 25, no. 3 (Fall 2011): 279–85.

Soon thereafter, the United States removed its troops in the region, bringing criticism on U.S. support to humanitarian operations as a viable option to decrease civil conflict.[81] However, the power vacuum resulted correlated to the attempted genocide of Rwandans and an even greater increase in civil-conflict.[82]

Growing out of this power vacuum, an insurgent group named al-Shabaab—or the youth—took over thousands of square miles in Somalia.[83] By 2007, United States aircraft began missions again, which destroyed training camps and provided surveillance and interdiction.[84] In 2010, the President Barak Obama declared Somalia a national emergency, which is still active as of 2016.[85] This declaration facilitated the commitment of SOF to build partner capacity, a small number of unilateral operations, and aircraft in support of both missions.[86]

The air campaign in Somalia has three unique components. First, U.S. airstrikes were designed primarily to defend the African Union Mission in Somalia (AMISOM)'s troops, a regional solution to Somalia's security issues.[87] Aircraft supporting operations in Somalia focused on support to special operation trainers and advisors to defeat al Shabaab and establish a secure environment.[88] Second, in addition to the airpower's supporting defense of AMISOM troops, U.S. airpower has held a relative monopoly on

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[81] Jon Western and Joshua S. Goldstein, "Humanitarian Intervention Comes of Age: Lessons from Somalia to Libya," *Foreign Affairs* 90, no. 6 (December 2011): 48–59.

[82] Chesterman, "Leading from Behind."

[83] Mark Mazzetti, Jeffrey Gettleman, and Eric Schmitt, "In Somalia, U.S. Escalates a Shadow War," *New York Times*, October 16, 2016, http://www.nytimes.com/2016/10/16/world/africa/obama-somalia-secret-war.html.

[84] Ty McCormick, "Exclusive: U.S. Operates Drones from Secret Bases in Somalia," Foreign Policy, July 2, 2015, https://foreignpolicy.com/2015/07/02/exclusive-u-s-operates-drones-from-secret-bases-in-somalia-special-operations-jsoc-black-hawk-down/; Chesterman, "Leading from Behind."

[85] "Letter—Continuation of the National Emergency with Respect to Somalia," April 4, 2016, https://www.whitehouse.gov/the-press-office/2016/04/04/letter-continuation-national-emergency-respect-somalia.

[86] Claudette Roulo, "AFRICOM Commander: Africa Home to Threat, Opportunity," Department of Defense, March 26, 2015, http://www.defense.gov/News/Article/Article/604367/africom-commander-africa-home-to-threat-opportunity.

[87] "U.S. Helps Africa Find African Security Solutions," accessed November 1, 2016, http://www.defense.gov/News/Article/Article/603008/us-helps-africa-find-african-security-solutions.

[88] "U.S. Airstrike Targets Al-Shabab Leader in Somalia," accessed November 1, 2016, http://www.defense.gov/News/Article/Article/788089/us-airstrike-targets-al-shabab-leader-in-somalia.

kinetic events from the air.[89] This situation, in addition to lower civilian casualty rates, suggests that the information asymmetry for civilians understanding who and why airstrikes are conducted is much lower than in Yemen.[90] Finally, President Obama has been highly vocal about airstrikes against al-Shabaab leaders, demonstrating a top-down information operations campaign.[91]

d. Air Campaign in Afghanistan

After 9/11, the United States entered Afghanistan with the goal to dismantle terrorist safe heavens and Taliban strongholds.[92] Using airpower in this sense was in support of indigenous forces being supported by SOF, giving credence to the local campaign. However, by 2004, massive troops were placed in Afghanistan, switching the air campaign to a primarily defensive campaign in support of U.S. troop movements on the ground. It is notable that that Operation Enduring Freedom (OEF) was a counter-terrorism campaign, whereas the International Security Assistance Force (ISAF) was designed to support NATO troops occupying Afghanistan.

Importantly, in 2010 the DOD recognized the need to accomplish and support local level grievances, and undertook the Village Stability Operations (VSO) program.[93] Due to the lack of cultural unification in Afghanistan, special operations were focused on the lowest level of governance, namely the village.[94] Although this program had heavy issues due to central government push back and Al-Qaeda or Taliban competing local level focus, the VSO program remained.[95]

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[89] Gibbons-Neff and Ryan, "U.S. Special Operations Force Extends Yemen Mission against Al-Qaeda."

[90] Mazzetti, Gettleman, and Schmitt, "In Somalia, U.S. Escalates a Shadow War."

[91] "Statement by NSC Spokesperson Ned Price on the Terrorist Attack in Puntland, Somalia," August 21, 2016, https://www.whitehouse.gov/the-press-office/2016/08/21/statement-nsc-spokesperson-ned-price-terrorist-attack-puntland-somalia; "Statement by Pentagon Press Secretary Peter Cook on U.S. Airstrike in Somalia."

[92] "Operation Freedom's Sentinel and Our Continued Security Investment in Afghanistan," accessed November 3, 2016, http://www.army.mil/article/156517.

[93] Mark Moyar, *Village Stability Operations and the Afghan Local Police* (MacDill AFB, FL: Joint Special Operations University, October 2014), 1.

[94] Ibid., 3.

[95] Ibid., 12.

In 2014, the prior OEF campaign was changed to Freedom Sentinel to continue the counter-terrorism strikes and attempt to dismantle al-Qaeda and Taliban forces.[96] However, the ISAF mission was exchanged for Operation Resolute Support, which more closely mirrored the original design of airpower in Afghanistan, namely supporting SOF missions of training, advising, and assisting indigenous forces.[97] Importantly, in Afghanistan, U.S. and coalition airpower have had dominance in the battlespace, ensuring that when airstrikes do happen, the information asymmetry was low. Afghans in general understand that U.S. and coalition forces are conducting airstrikes; however, grievances still exist based on civilian casualties, such as the 2015 airstrikes on the Kunduz hospital.[98]

e. Air Campaign in Pakistan

The federally administered tribal areas (FATA) in Pakistan have long been a haven for tribes that resisted states and colonialism.[99] Within a rugged and mountainous terrain, a reported 1.459 million individuals have been displaced by violent conflict within the region.[100] U.S. actions in Pakistan have typically taken care not to involve boots on the ground, instead opting for a drone targeting strategy as President Obama noted to the National Defense University.[101] However, beyond isolated drone strikes being conducted to dismantle al-Qaeda, not much exists to explain information operations that may or may not exist in the region. Even so, the Obama administration noted in 2016

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[96] Helene Cooper, "Pentagon Says Airstrikes Targeted 2 Qaeda Leaders in Afghanistan," *New York Times*, October 26, 2016, http://www.nytimes.com/2016/10/27/world/asia/afghanistan-airstrikes-al-qaeda.html.

[97] "It's 2015. Time for Some New U.S. Operations in Iraq and Afghanistan," January 6, 2015, http://www.pri.org/stories/2015-01-06/its-2015-time-some-new-us-operations-iraq-and-afghanistan.

[98] Liam Stack, "U.S. Airstrikes, Afghan Casualties," *New York Times*, October 4, 2015, http://www.nytimes.com/interactive/2015/10/04/world/asia/us-airstrikes-afghan-casualties.html.

[99] Francois Tanguay-Renaud, "Post-Colonial Pluralism, Human Rights & (and) the Administration of Criminal Justice in the Federally Administered Tribal Areas of Pakistan," *Singapore Journal of International & Comparative Law* 6 (2002): 541.

[100] "The World Factbook 2013–14," Central Intelligence Agency, 2013, https://www.cia.gov/library/publications/the-world-factbook/index.html.

[101] "Remarks by the President at the National Defense University," May 23, 2013, https://www.whitehouse.gov/the-press-office/2013/05/23/remarks-president-national-defense-university.

that airstrikes in Pakistan and Yemen have had up to 116 civilian casualties.[102] Collectively then, the isolated drone strikes in Pakistan may have a high information asymmetry between the state dropping the munitions, in this case the United States, and the civilian populous. In contrast, insurgents have focused on local level support in the FATA region, allowing a much easier flow of information to the populous.[103]

2. Hypotheses

Table 1 shows the history of air campaigns among the different coalition and U.S. operations, as well as air campaign differences among Yemen, Pakistan, Afghanistan, and Somalia. In Pakistan and Yemen, information dissymmetry between military operations and civilian understanding is high. According to open source reports, the targeting scheme in Pakistan has been purely offensive. However, it is unknown if U.S. or Pakistan airstrikes have included information operations. Therefore, a wide range of state information asymmetry—from high asymmetry to low asymmetry—is plausible. Even so, geographically, the FATA region is away from the established Pakistani government and has the potential to limit the reach of state information region within the area. In addition, at least three insurgent groups exist with fully functioning, and mature, information operations. This type of operation presents the possibility that within Pakistan, the information operations conducted by insurgents may outweigh any information operations conducted by the United States or Pakistan.

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[102] Tribune News Services, "Obama Administration: Up to 116 Civilians Killed in U.S. Airstrikes," *Chicago Tribune*, July 1, 2016, http://www.chicagotribune.com/news/nationworld/ct-obama-drone-strike-civilian-deaths-20160701-story.html.

[103] Johnston and Sarbahi, "The Impact of U.S. Drone Strikes on Terrorism in Pakistan," 6.

Table 1. Air Campaign Differences among Yemen, Pakistan, Afghanistan, and Somalia

	Yemen	Pakistan	Afghanistan	Somalia
Targeting Schemes	Saudi led coalition: Coercion/defensive US CT: Network Targeting	US CT: Network Targeting	US COIN: Defensive US CT: Network Targeting	Coalition COIN: Defensive US CT: Network Targeting
State information strength	Ousted State using Coalition Support for Information Operations	Effective State: Unknown Information Operations in conjunction with airstrikes	Growing State: Growing Information Operations at the Local Level	Established State: Established Information Operations at Local Level
Insurgent Information Strength	Fully functioning Information Operations at the Local Level	Fully functioning Information Operations at the Local Level	Fully functioning Information Operations at the Local Level	Developing Information Operations
Information Asymmetry Hypothesis	State: Med-High Info Asymmetry AQAP: Low Info Asymmetry	State: Unk Info Asymmetry AQ/Hezbollah/Taliban: Low Info A.	State: Low Info Asymmetry AQ/Taliban: Low Info Asymmetry	State: Low Info Asymmetry al-Shabbab: Low-Med Info Asymmetry

In Yemen, the lack of a strong Yemini state has contributed to a high information asymmetry between airstrikes and civilians for several reasons. First, the presence of several competing air campaigns ensures that civilians much choose between understating an airstrike as a response to terrorist actions, or a Saudi-led intervention against an interim government. The ousted state of Yemini government must rely on outside agencies to provide information operations to its civilians regarding airstrikes. Unfortunately, the lack of precision munitions with Saudi-led airpower has led to an abundance of civilian casualties. These casualties are an important conversation starter for many civilians seeking answers; however, the state provides little to information. In contrast, the Iranian supported Ansar Allah and AQAP are adept at providing narratives in response to airstrikes. These combined observations suggest that the information dissymmetry is high between airstrikes and civilian understanding, leaving a gap for narrative distribution.

Hypothesis 1: Campaigns experiencing a higher level of information asymmetry between civilians and military airstrikes—such as Yemen and Pakistan—will have a higher level of political violence following an airstrike.

In contrast, Somali and Afghan information dissymmetry between military operations and civilian understanding is relatively low. In Afghanistan, it is due to years of NATO and U.S. unilateral actions that have turned the focus on local level grievances

and village support operations. Additionally, Afghan operations turned in 2014 to working with and through indigenous army and police forces, giving more credence to information operations. Detracting from this benefit, defensive airpower campaigns leverage kinetic strikes in defense of military troop movements. In these cases, government agencies are typically reactive, and as such, do not plan effective information campaigns. When facing unitary insurgencies, such as the Taliban and al-Qaeda, civilians within the area are left primarily to receive framing narratives from insurgencies rather than the state following a strike. Even so, it is possible that information operations conducted by U.S. and Afghan militaries at the lowest village level have decreased the information asymmetry between the state and civilian below that of the insurgency.

In Somalia, a growing—as opposed to failed—state could theoretically manage the information space better. However, it is unknown if the multitude of supporting African nations increase or decrease information asymmetry. In addition, airstrikes are being conducted primarily, if not solely, by the United States in a primarily offensive nature. It is assumed, based on the capabilities of the United States Air Force that defensive airstrikes that have been conducted done with a critical eye to decrease civilian casualties and unnecessary destruction of property. This allows the state and executing agency to plan information operations in support of the network targeting. Although the insurgency is unitary, and able to provide more counter-narratives to airstrikes, this chapter hypothesizes that the state status, type of targeting, and air campaign status will result in a lower level of violence after an airstrike compared to Afghanistan and Yemen. Therefore, the following is hypothesized.

Hypothesis 2: Campaigns experiencing a lower level of information asymmetry between civilians and military airstrikes—such as Afghanistan and Somalia—will have a lower level of political violence following an airstrike.

B. STATISTICAL STRATEGY

This chapter uses a spatiotemporal methodology for evaluating the effects of airstrikes on political violence. Spatiotemporal measurements were conducted from 2002 to 2016 with measurements in Afghanistan being the primary deviation due to a lack of

data until 2015. This chapter analyzes the relationship between airstrikes and political violence not only across Yemen, Somalia, Pakistan, and Afghanistan, but also within them. Within each model, spatiotemporal disks prior to the airstrike are used to control for both current levels of political violence and classical determinants of violence, such as social status disparities, economic status disparities, geographic factors, and horizontal communication availability. Airstrike locations for Yemen, Somalia, Pakistan, and Afghanistan can be seen in Figures 1, 2, 3, and 4, respectively. Airstrike density is signified in dark red with decreasing airstrike density in yellow and white. Yemeni airstrike locations in Figure 1 display a dispersal in central and western Yemen primarily. Somali airstrike locations in Figure 2 are primary on the southern and northeastern portion of the country. Pakistani airstrike locations in Figure 3 are concentrated on the western boarder of Pakistan in the FATA. Finally, Afghan airstrike locations in Figure 4 are more uniformly dispersed in the eastern portion of the country.
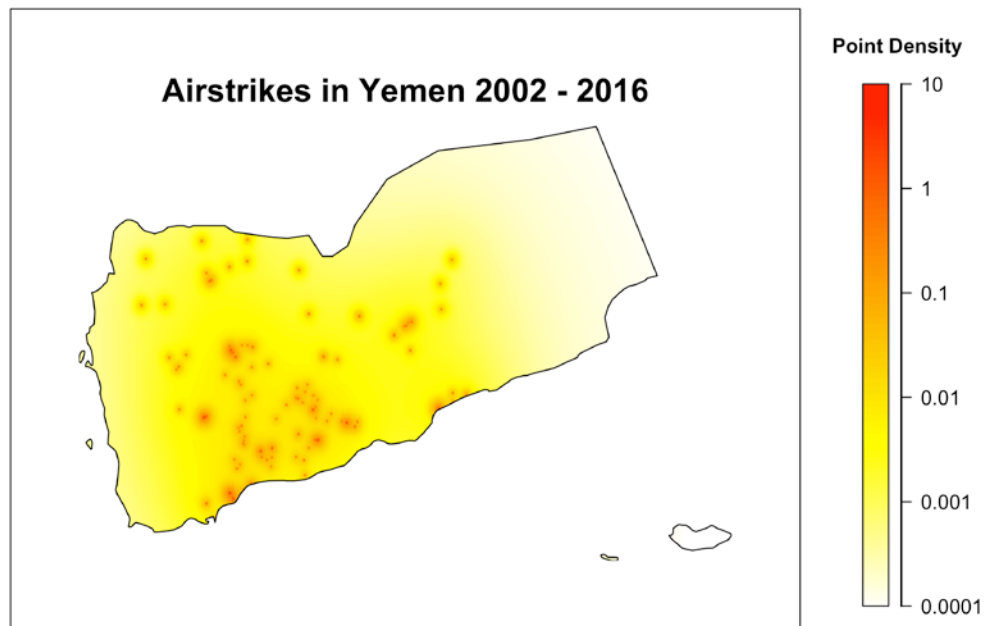
Figure 1.   Airstrike Density in Yemen from 2002 to 2016
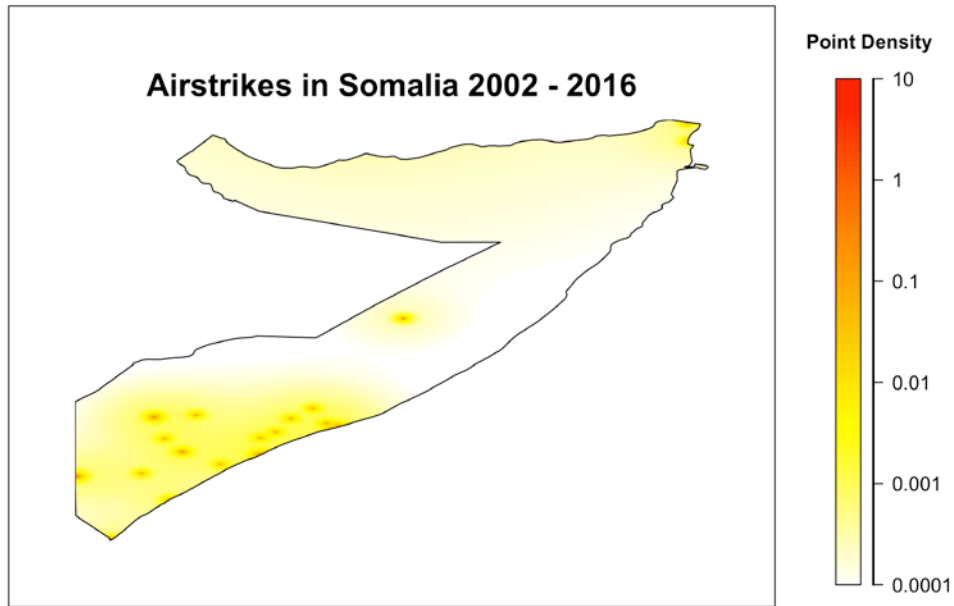
Figure 2.   Airstrike Locations in Somalia from 2002 to 2016
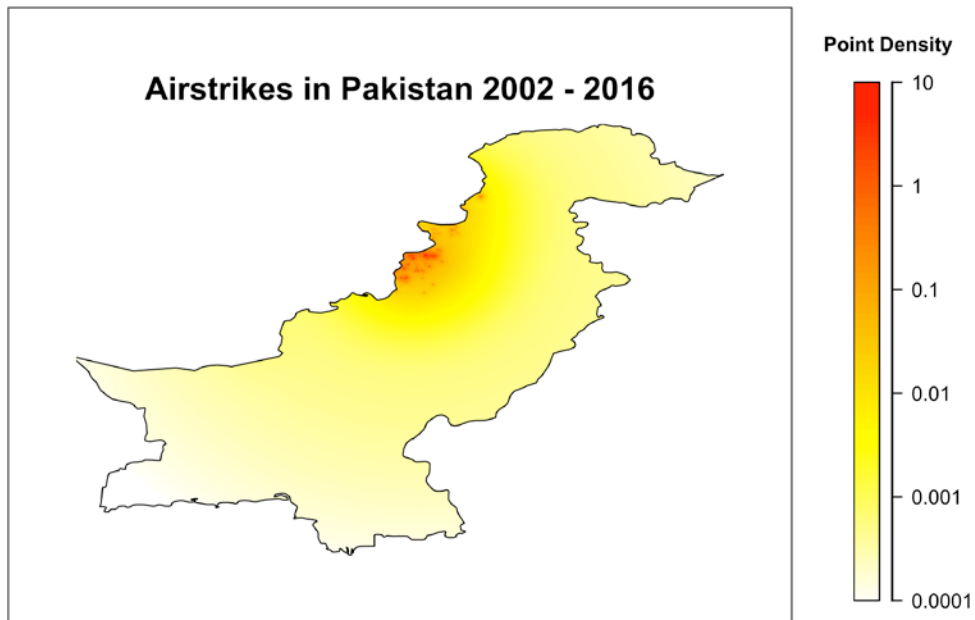
Figure 3.   Airstrike Locations in Pakistan 2002 to 2016
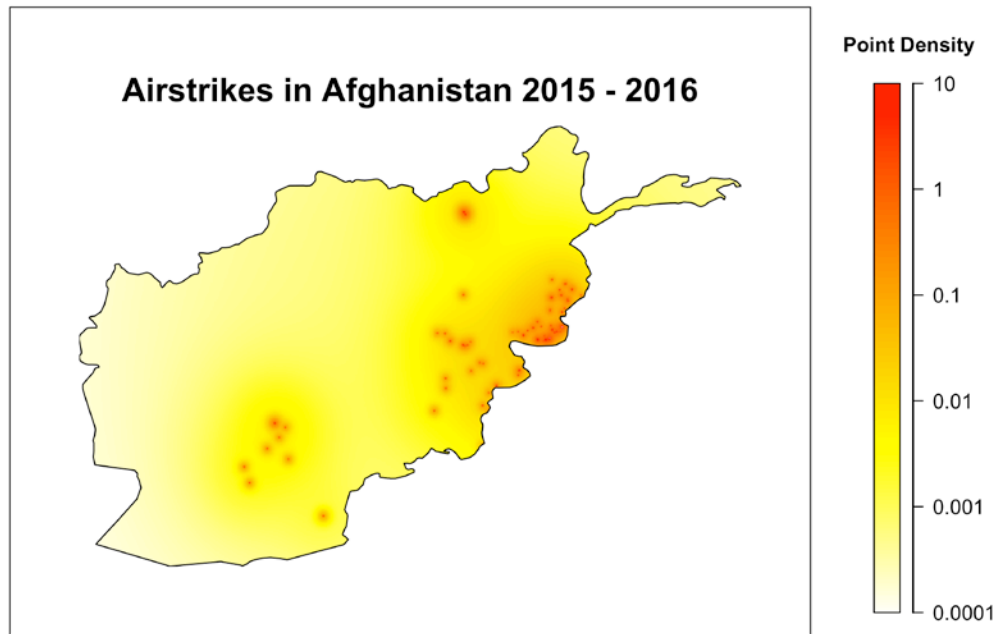
Figure 4.   Airstrike Locations in Afghanistan 2015 to 2016

In the models reported below the unit of analysis is the individual geo-coded airstrike. Each airstrike is associated with a spatiotemporal disk that varies from 10 kilometers to 50 kilometers, and assesses for previous levels of political violence and additional control variables. Importantly, these disks will vary in time based on the timeframe measured post-strike. In other words, spatiotemporal locations measured for control variables 30 days prior to a strike are assessed for their increases or decreases in political violence 30 days following the strike. Similarly, spatiotemporal locations measured 60, 90, and 120 days prior to a strike are measured for 60, 90, and 120 days, respectively following the strike.

Airstrike measurements are obtained from the New American Foundation's dataset on airstrikes combined with the International Bureau of Investigative Journalism dataset on airstrikes.[104] Geocoding focused on using the available information from the datasets and then refining locations based on media reports. Individual geo-coding for

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[104] "Covert Drone War Archives," accessed September 25, 2016, https://www.thebureauinvestigates. com/category/projects/drones/.

airstrikes are refined as possible given the available media data. The centroid of towns is used as an initial starting point where amplifying information could more the geo-coded event in a specific direction. For example, if the airstrike were conducted against a vehicle that was on a specific road in a town, the geo-tagging would deviate from the centroid of the town to be offset to the road. Order of precedence for geo-coding was given to the centroid of towns. Offsets to roads or large geographic features were allowed based upon media reports. Geo-coding should be understood as information based on media reports, and not necessarily the precise location of an airstrike. Geo-coding also used latitudes and longitudes that provide bandwidths no smaller than one kilometer for a given geographic location.

C.   STATISTICAL RESULTS

Statistical results in Table 2 show that after accounting for political violence in the 60 days prior to an airstrike, post-strike numbers are associated with an increase in political violence. The results are statistically significant at up to the 99% confidence level for 30, 60, 90, and 120 days following the airstrike event. These initial models suggest that airstrikes may have a baseline effect across campaigns of increasing subsequent political violence. This may point to the existence of fundamental mechanisms that span across all campaigns. For instance, it may be that airstrikes provide a political opportunity, which is susceptible to narrative distribution. However, to assess these trends truly, each campaign must be considered separately.

Table 2.   Overall Political Violence in Response to Airstrikes

Combined Airstrikes and Political Violence (.1 degrees lat long)			
Dependent variable: Post-airstrike political violence			
30 days	60 days	90 days	120 days
Total KIA 0.018*** (0.004)	0.010** (0.004)	0.014*** (0.005)	0.017*** (0.005)
Pre-airstrike pol-violence 0.259*** (0.020)	0.169*** (0.012)	0.137*** (0.009)	0.122*** (0.007)
Constant -0.398*** (0.082)	0.174** (0.073)	0.437*** (0.075)	0.627*** (0.075)
Observations 754	744	732	713
Log Likelihood -1,132.202	-1,415.282	-1,595.184	-1,708.515
theta 0.554*** (0.052)	0.664*** (0.055)	0.708*** (0.054)	0.704*** (0.051)
Akaike Inf. Crit. 2,270.403	2,836.564	3,196.368	3,423.029
Note:			*p<0.1; **p<0.05; ***p<0.01
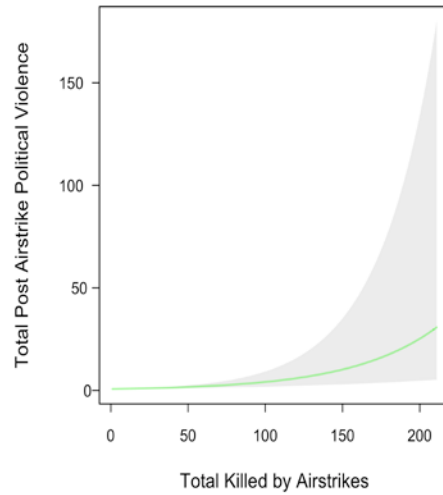
When considering political violence in response to airstrikes in Yemen, events were associated with increases in political violence within 30, 60, 90, and 120 days. The results in Table 3 show a four-fold substantive effect and are associated with *p*-values < 0.01 for the aforementioned timeframes.

Table 3.   Yemini Political Violence in Response to Airstrikes

Yemen Airstrikes and Political Violence (.1 degrees lat long)			
Dependent variable: Post-airstrike political violence			
30 days	60 days	90 days	120 days
Total KIA 0.051*** (0.015)	0.038*** (0.014)	0.030** (0.015)	0.030** (0.015)
Pre-airstrike pol-violence 0.299*** (0.037)	0.195*** (0.021)	0.149*** (0.017)	0.115*** (0.014)
Constant -0.910*** (0.204)	-0.494*** (0.182)	-0.071 (0.186)	0.206 (0.184)
Observations 200	200	200	196
Log Likelihood -269.654	-316.250	-360.973	-387.072
theta 0.344*** (0.063)	0.400*** (0.070)	0.335*** (0.052)	0.334*** (0.049)
Akaike Inf. Crit. 545.308	638.501	727.947	780.144
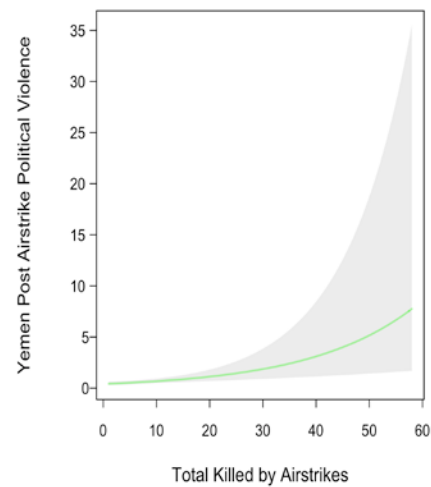
Table 4 displays the political violence in response to airstrikes in Somalia. Interestingly, it appears that airstrikes are negatively associated with subsequent political violence. In other words, the more killed in action from an airstrike, the fewer political violence events observed at the 90, and 120-day mark at the 95% and 99% confidence level respectively with a substantive effect of a four-fold decrease. This is important for two reasons; first, this deviates substantially from the overall trends of political violence in response to airstrikes seen in Table 2. In other words, the evidence indicates that airstrikes do not have a uniform effect across campaigns. This suggests that more variables are at play that may have changed the perception of airstrikes in Somalia. Second, based on the lack of statistically significant results until after 60 days the effects of airstrikes can be seen as having long-term effects, which may not be initially visible. This suggests that correlations with information operations and sentiment may have the best explanatory power when viewed across longer time frames.

Table 4.   Somali Political Violence in Response to Airstrikes

Somalia Airstrikes and Political Violence (1. degrees lat long)

| | Dependent variable: Post-airstrike political violence | | | |
	30 days	60 days	90 days	120 days
Total KIA	-0.006	-0.022	-0.038**	-0.048***
	(0.017)	(0.018)	(0.017)	(0.018)
Pre-airstrike pol-violence	0.232***	0.136***	0.099***	0.079***
	(0.048)	(0.030)	(0.018)	(0.015)
Constant	-0.006	0.684**	1.147***	1.655***
	(0.333)	(0.315)	(0.276)	(0.266)
Observations	29	27	27	27
Log Likelihood	-55.475	-63.297	-71.960	-81.453
theta	0.970** (0.492)	0.874** (0.345)	1.025*** (0.359)	1.001*** (0.327)
Akaike Inf. Crit.	116.951	132.594	149.920	168.905
Note:				*p<0.1; **p<0.05; ***p<0.01
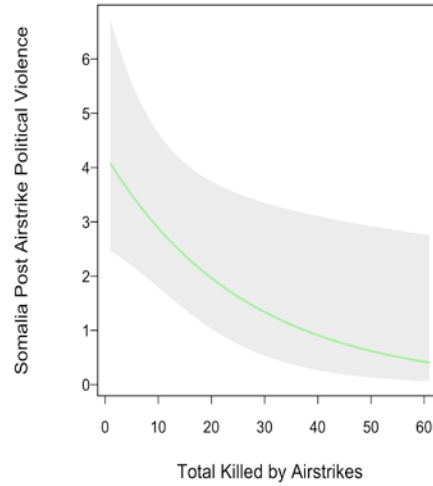
Table 5 displays the overall political violence association in response to airstrikes in Pakistan. Interestingly, the results display a positive association between total individuals killed by an airstrike and political violence at the 120-day mark and the 90% confidence level. These findings suggest a different response to airstrikes than were found in Sarbahi and Johnston, which may result for two reasons. First, airstrikes in this thesis were weighted dependent upon the number of individuals killed per event. This weighting could account for the differences in measurements. Second, this thesis includes three additional years of airstrikes not accounted for by Sarbahi and Johnston. In either case, the overall trend of airstrikes to increase political violence across campaigns and equal treatment of airstrikes across countries gives credence to new results.

Table 5.   Overall Pakistani Political Violence in Response to Airstrikes

Pakistan Airstrikes and Political Violence (.1 degrees lat long)

| | Dependent variable: Post-airstrike political violence | | | |
	30 days	60 days	90 days	120 days
Total KIA	0.013	0.010	0.007	0.013**
	(0.009)	(0.008)	(0.007)	(0.007)
Pre-airstrike pol-violence	0.207***	0.137***	0.127***	0.123***
	(0.029)	(0.018)	(0.015)	(0.012)
Constant	-0.171	0.421***	0.685***	0.813***
	(0.120)	(0.108)	(0.105)	(0.103)
Observations	400	400	400	400
Log Likelihood	-628.524	-816.688	-931.981	-1,027.294
theta	0.681*** (0.088)	0.823*** (0.091)	0.928*** (0.094)	0.993*** (0.095)
Akaike Inf. Crit.	1,263.048	1,639.377	1,869.963	2,060.588

Note: *p<0.1; **p<0.05; ***p<0.01
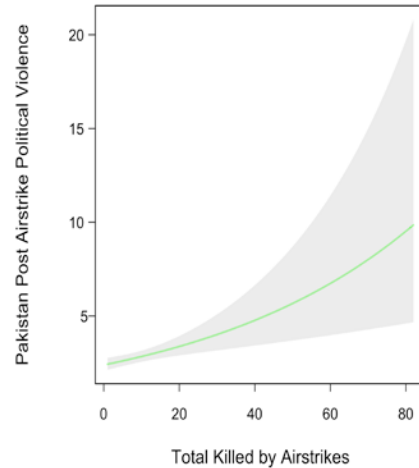
The results shown in Table 6 display the effects of airstrikes on political violence in Afghanistan. Interestingly, the results are statistically significant at the 99% confidence level, but unlike the other campaigns, the results differ depending on the spatial scale of the spatiotemporal disks used in the models. At the smallest scale, using disks with radii of 10 kilometers, airstrikes appear to be associated with increases in political violence.

These findings support the propositions by Lyall who also discovered an association between airstrikes and political violence.[105] However, as seen in Table 7, using radii of approximately 50 kilometers, airstrikes are associated with decreases in political violence. There could be two reasons for this reversal; first, airstrike effects within Afghanistan could be limited due to the mountainous terrain and lack of horizontal communication across the country. In effect, this would limit narrative distribution about an airstrike that would increase post-strike violence via insurgents to a confined area. Second, counter narratives by U.S. and Afghani forces could have effects outside of local populations that could be significantly changed by competing narratives. This could also suggest that local level grievances in Afghanistan are more pronounced than in other countries.

Table 6.   Afghan Political Violence in Response to Airstrikes (10km)

Afghanistan Airstrikes and Political Violence (.1 degrees lat long)			
Dependent variable: Post-airstrike political violence			
30 days	60 days	90 days	120 days
Total KIA			
0.011**	0.002	0.020***	0.024***
(0.005)	(0.005)	(0.007)	(0.008)
Pre-airstrike pol-violence			
0.231***	0.163***	0.110***	0.108***
(0.046)	(0.034)	(0.023)	(0.021)
Constant			
-0.224	0.321*	0.489***	0.621***
(0.179)	(0.170)	(0.164)	(0.175)
Observations			
125	117	105	90
Log Likelihood			
-207.059	-236.884	-237.830	-221.573
theta			
0.824*** (0.193)	1.010*** (0.220)	1.486*** (0.321)	1.339*** (0.292)
Akaike Inf. Crit.			
420.117	479.768	481.659	449.146

Note: *p<0.1; **p<0.05; ***p<0.01
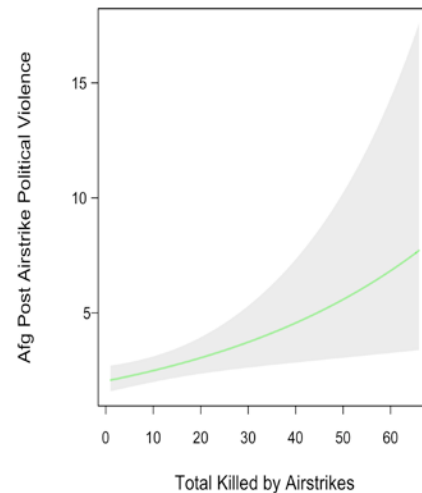
[105] Lyall, "Bombing to Lose? Airpower and the Dynamics of Coercion in Counterinsurgency Wars," 1–2.

Table 7.   Afghan Political Violence in Response to Airstrikes (50km)

Afghanistan Airstrikes and Political Violence (.5 degrees lat long)			
Dependent variable: Post-airstrike political violence			
30 days	60 days	90 days	120 days
Total KIA			
-0.002	-0.005**	-0.0001	-0.002
(0.003)	(0.002)	(0.002)	(0.003)
Pre-airstrike pol-violence			
0.067***	0.043***	0.028***	0.022***
(0.007)	(0.003)	(0.002)	(0.001)
Constant			
1.560***	1.940***	2.240***	2.496***
(0.101)	(0.092)	(0.074)	(0.075)
Observations			
125	117	105	90
Log Likelihood			
-381.193	-405.661	-377.269	-346.459
theta			
6.378*** (1.369)	9.584*** (2.088)	18.023*** (4.549)	16.303*** (3.981)
Akaike Inf. Crit.			
768.385	817.321	760.537	698.918
Note:			*p<0.1; **p<0.05; ***p<0.01
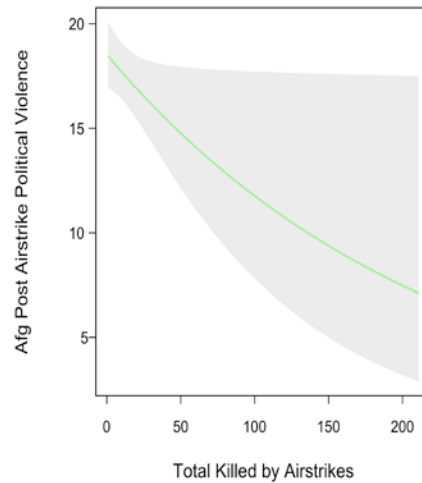
D.   DISCUSSION AND INTERIM CONCLUSIONS

The statistical results presented here support the hypothesis that political violence tends to increase in Yemen and Pakistan in response to airstrikes. This implies that the Yemen and Pakistan campaigns are experiencing a higher level of information asymmetry between civilians and military airstrikes, leading to a higher level of political violence following an airstrike. As argued above, airstrikes are subject to information asymmetry, resulting in extreme interpretations of events. The findings provide robustness to the Hirose, Imai, and Lyall study that suggests sentiment can be a discriminator for political violence.[106]

The results also suggest support for Hypothesis 2, which predicted that campaigns experiencing a lower level of information asymmetry between civilians and military airstrikes—such as Afghanistan and Somalia—will produce a lower level of political violence following an airstrike. In Somalia, the information asymmetry between the state and insurgency clearly favors the state. In Afghanistan, the political violence is seen as increasing within a 10-kilometer radius and decreasing at a 50-kilometer radius. In this

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[106] Hirose, Imai, and Lyall, *Civilian Attitudes and Insurgent Tactics in Civil War.*

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case, this could be the result of competing information campaigns at the local level. Whereas insurgencies could leverage the effects of the airstrike in the immediate local area, villages outside of the immediate area are under a separate information asymmetry condition due to the VSO conducted by special operations.

The models presented in this chapter give support for an overall violent response to airstrikes in limited irregular battles. This model gives credence that airstrikes have the potential to increase political violence, and as such, should be taken into account for policy concerns when conducting limited irregular warfare. It should be understood however that political violence is a tool commonly used when an insurgency is both fledgling and flailing, and as such, as a poor discriminator of success in limited irregular warfare.

In addition to the overall violent response, the models in this chapter support prior academic studies in Afghanistan that associate political violence increases with airstrike locations. However, when used across campaigns, this chapter does not support prior academic studies in Pakistan. In this case, the differences in methodology between the Afghan and Pakistani studies are the most likely rational for the differences in results. Importantly, the study in Pakistan was bounded by region and could have been subject to modifiable areal unit issues, wherein the size of the boundaries erroneously impact the injects, and as such, the results.[107] In contrast, the study in Afghanistan was not bounded by regions, and as such, are more accurate. The models in this thesis were also bounded by distance; however, several distances were measured to increase the robustness of the results. In this way, the study results reported in this thesis gain more credibility when comparing results from previous studies.

Finally, the models presented in this chapter give credence for assessing the strategic impact of information asymmetry in limited irregular battles. Although exporting these results beyond the scope of the study cannot be directly supported, future models should look to correlate actual information operations with sentiment to

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[107] For more information on the modifiable areal unit issue in statistical analysis, view A. S. Fotheringham and D. W. S. Wong, "The Modifiable Areal Unit Problem in Multivariate Statistical Analysis," *Environment and Planning A* 23, no. 7 (July 1, 1991): 1025–44, doi: 10.1068/a231025.

understand the granular assessment of information asymmetry. Even so, enough evidence exists to suggest that airstrikes do impact sentiment, and sentiment is modified by information asymmetry. Information asymmetry, as a concept, can be used to generate the hypothesis on the ability of airstrikes to associate with higher or lower levels of political violence.

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III.   AIRSTRIKES AND POLITICAL EXTREMISM

You don't barrel bomb children!

—John Kerry
United Nations Syria Support Group, 28 Sep 2016

To what extent—if any—do airstrikes affect civilian support of a state, an insurgency, or an external coalition? More specifically, do locations with higher incidences of airstrikes correlate with increases or decreases in popular support for political entities? This chapter uses geospatial measurements of popular support for terrorist groups and the Yemeni state from November 2013 to January 2014, combined with airstrike data from 2002 to 2014, to explore this issue. The results show that airstrikes are not simply associated with higher or lower support for a particular side in the conflict, but rather are associated with higher levels of political extremism on both sides of the conflict.

Current quantitative research on airstrikes focuses exclusively on airpower attempts to coerce an insurgent organization to reduce terrorist acts or supporting activities.[108] Airpower-related studies examine civilian victimization, targeted killings, drone ethics, and airpower coercion.[109] These studies have left a significant gap in the assessment of associations between airstrikes and popular attitudes and perceptions.[110]

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[108] Johnston and Sarbahi, "The Impact of U.S. Drone Strikes on Terrorism in Pakistan"; Lyall, "Bombing to Lose? Airpower and the Dynamics of Coercion in Counterinsurgency Wars"; Megan Smith and James Igoe Walsh, "Do Drone Strikes Degrade Al Qaeda? Evidence from Propaganda Output," *Terrorism and Political Violence* 25, no. 2 (April 2013): 311–27, doi: 10.1080/09546553.2012.664011; David A. Jaeger and Zahra Siddique, *Are Drone Strikes Effective in Afghanistan and Pakistan? On the Dynamics of Violence between the United States and the Taliban*, IZA DP, Discussion Paper Series (Bonn, Germany: Institute for the Study of Labor, 2011).

[109] Pape, *Bombing to Win*; Horowitz and Reiter, "When Does Aerial Bombing Work?, 147–73; Sechser, "Reputations and Signaling in Coercive Bargaining"; Allen, "Time Bombs Estimating the Duration of Coercive Bombing Campaigns," 112–33; King, "Coercive Airpower in the Precision Age: The Effects of Precision Guided Munitions on Air Campaign Duration"; Bachman, "The Lawfulness of U.S. Targeted Killing Operations outside Afghanistan," 899–918; Jordan, "Attacking the Leader, Missing the Mark," 7–38; Strawser, *Killing by Remote Control: The Ethics of an Unmanned Military*; Jai Galliott, *Military Robots: Mapping the Moral Landscape* (Aldershot, United Kingdom: Ashgate Publishing, 2015).

[110] Sentiment in this case is the view or attitude of support for the state or non-state entity as determined by a series of self-reported survey questions.

As U.S. foreign policy pivots away from large-scale land invasion strategies to a strategy of SOF and local partners on the ground augmented by airpower, understanding how kinetic events impact sentiment is invaluable for executing policy goals.[111]

This chapter first retraces the history of the Republic of Yemen and ongoing insurgencies to apply context to existing civilian attitudes. Afterward, literature applicable to airpower and the potential diffusion of popular support will result in hypothesis development. Next, the data and analysis process, including the development of density grids using multi-bandwidth kernel density estimates, will be explained to showcase the explanatory power of the chosen models. Finally, this chapter concludes with findings and conclusions that support the overall study of airstrikes in irregular warfare.

A.   THE STUDY OF KINETIC EVENTS AND POPULAR SUPPORT

This study compiles a new open-source dataset on airstrike locations by combining two existing geo-referenced databases. This chapter proceeds by first cross-referencing accounts of airstrikes, and eliminating redundancies. Afterwards, those strikes that are unique to a particular database were tested for reporting veracity and endurance.[112] Data measuring the spatial location of popular support is drawn from Global Research and Assessment Program (GRAP) for United States Special Operations Command (USSOCOM) J39. This data source makes it possible to associate the locations of airstrikes with the locations of patterns of political support in Yemen.[113]

This association is assessed by first converting the airstrike data into a spatial grid (aka "raster") by generating a smoothed estimate of the density of airstrike points over space. This density is then compared to the spatial patterns of support for various political entities in Yemen. The statistical analysis shows the following—seemingly conflicting—

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[111] Department of Defense, *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense* (Washington, DC: Department of Defense, 2012), 6.

[112] Veracity was measured by reports that contained at least two reputable and external news stations. Endurance was measured by links that remain active as of July 2016.

[113] U.S. Special Operations Command (J39), *Yemen Program Support, Research Report Wave #4* (MacDill Air Force Base, FL: U.S. Special Operations Command (J39), 2014).

results. First, locations with higher densities of airstrikes resulted in higher levels of extreme support for al Qaeda, Ansar Allah, and violent extremism in Yemen. Second, locations with higher densities of airstrikes are associated with higher levels of extreme support for the government of Yemen. Third, locations with higher densities of airstrikes are associated with higher levels of extreme support for Western involvement. All findings pass multiple robustness checks and suggest that the effects of airstrikes are not simply associated with increases or decreases in support for a particular political entity. Instead, these findings support the idea that airstrike effects beyond immediate destruction are *amoral* effects. In other words, airstrike effects are not predisposed to causing negative sentiment for a standing state or government. Instead, airstrikes appear to move individuals from bystanders to participants in the political process, causing extreme support for both the state and insurgencies. In this way, airstrikes may be subject to civilian interpretation through narrative distribution. Said another way, political opportunities are available for exploitation by individual bias, social structure, and external accounts. Airstrikes as a political opportunity, allow opportunities beyond normal circumstances to mobilize populations through a particular narrative and exist as precursors to potential political violence.

1.   Yemen: A Brief History of Turmoil

The Republic of Yemen is a country of embattled history and strategic importance. Yemen is surrounded by the Gulf of Aden to the south, Saudi Arabia to the north, and Oman to the east. In the 20th century, Yemen was divided into North and South Yemen, which existed as two states until 1990 when President Ali Abdullah Saleh was elected.[114] Although President Saleh united the two countries, he became known for state-sanctioned corruption. Fraud was widespread and included withholding food and medical supplies from the population.[115] In 1994, a Shia Houthi rebellion and a Sunni al-Qaeda rebellion began in the northwest and south, spawning two civil wars that lasted

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[114] "The World Factbook 2013–14."

[115] U.S. Government, U. S. Military, and Department of Defense, *Yemen in Perspective—Orientation Guide and Yemeni Cultural Orientation: Geography, History, Economy, Security, Customs, Aden, Sanaa, Sunni and Shi'a, Sufism, Qat Chewing, Al Qaeda, Houthi Rebellion* (Progressive Management, 2015).

until 2012. After the Arab Spring in 2011, President Saleh was succeeded by President Hadi, who promptly lost the capital to the Houthi rebels and large portions of the south to Al-Qaeda in November 2014.[116] After a coup d'état, Hadi was forced from the presidency succeeded by Mohammed Ali al-Houthi.

Historically, Yemen has been a hotbed for broad socio-economic grievances. During his tenure, President Saleh often used extra-judicial violence to quell popular uprisings and anti-government speech. The UN reported that 92% of women in Yemen suffered violence within their households.[117] In addition, the World Economic Forum has reported the gender gap between men and women in Yemen as the last of 142 nations, with the fewest political and educational opportunities for women.[118] Currently, Yemen has an unemployment rate of nearly 40%, which has elicited U.S. support of $1 billion since 2007.[119] In addition, it has one of the fastest growing populations in the region at a rate of 2.9% growth annually.[120]

Two primary insurgent groups have been vying for control of Yemen against the standing government, Shia Houthis and Sunni al-Qaeda. The Shia Houthis—sometimes called Ansar Allah—have been pressing their case in the northwestern corner of Yemen and slowly expanding toward southern Yemen.[121] Believing in their lawful and historical governance of Yemen, Houthis are self-described descendants of the Prophet Muhammad.[122] From this perspective and building on civil-rights grievances, the Houthis

[116] "Yemen Ruling Party Sacks President Hadi," November 8, 2014, http://www.dw.com/en/yemen-ruling-party-sacks-president-hadi/a-18048738.

[117] "Fighting for Justice for Women amidst Conflict in Yemen," accessed November 15, 2016, http://www.unfpa.org/news/fighting-justice-women-amidst-conflict-yemen.

[118] "Global Gender Gap Report 2014," accessed November 15, 2016, https://www.weforum.org/reports/global-gender-gap-report-2014/.

[119] U.S. Government Accountability Office, *U.S. Assistance to Yemen. Actions Needed to Improve Oversight of Emergency Food Aid and Assess Security Assistance* (GAO-13-310) (Washington, DC: U.S. Government Accountability Office, 2013).

[120] U.S. Government, U. S. Military, and Department of Defense, *Yemen in Perspective—Orientation Guide and Yemeni Cultural Orientation*.

[121] Abdel Bari Atwan, *After Bin Laden: Al Qaeda, the Next Generation*, reprint ed. (New York: The New Press, 2013), 82.

[122] U.S. Government, U. S. Military, and Department of Defense, *Yemen in Perspective—Orientation Guide and Yemeni Cultural Orientation*.

directly confronted the government of Yemen during the civil wars. Six on-and-off conflicts ended in a declared ceasefire in 2010 but were rekindled in 2012.[123]

Opposing both the standing government and the Shia-based Houthis is Sunni-based al-Qaeda. Al-Qaeda broadly believes in violently countering Western influence and reviving an Islamic caliphate.[124] Osama Bin Laden founded Al-Qaeda in Yemen (AQY) in 2000 with an initial strategy focused on local-level support. This support used welfare programs and essential material provisions to build an insurgent base in disadvantaged locations.[125] More specifically, AQY moved village to village in the southern Sunni-dominated countryside, spreading leaflets, media, and personal contacts. This dissemination enabled small-scale mobilization of deeply entrenched local populations, eventually paving the way to flood the area with additional insurgents.

In 2006, remnants of Al-Qaeda in Saudi Arabia merged with AQY to avoid persecution, as well as improve branding and global perception.[126] The merged group became known as al-Qaeda in the Arabian Peninsula (AQAP), and in 2009, began an effective propaganda campaign using jihad to counter local-level grievances.[127] The reorganization allowed additional resources and flexibility that in turn facilitated growth. In fact, AQAP's growth and stake in destabilizing the Yemeni government from peace talks with the Houthis was so troubling that it quickly developed into a UN Security Council discussion.[128]

Between 2009 and 2010, AQAP attempted to build on popular sentiment and expand war-fighting capabilities to cripple the Government of Yemen in three ways.

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[123] "The World Factbook 2013–14."

[124] Tom Quiggin, "Understanding Al-Qaeda's Ideology for Counter-Narrative Work," *Perspectives on Terrorism* 3, no. 2 (November 25, 2010), http://www.terrorismanalysts.com/pt/index.php/pot/article/view/67.

[125] Atwan, *After Bin Laden*, 99.

[126] Laura Smith-Spark, "What Is Al Qaeda in the Arabian Peninsula?," *CNN*, accessed November 15, 2016, http://www.cnn.com/2015/01/14/middleeast/yemen-al-qaeda-arabian-peninsula/index.html.

[127] "Al-Qaeda in the Arabian Peninsula (AQAP)," accessed November 15, 2016, http://www.cfr.org/yemen/al-qaeda-arabian-peninsula-aqap/p9369.

[128] "UN News—At Security Council, UN Envoy Says Yemen on 'Rapid Downward Spiral' as Tensions Rise," March 22, 2015, https://www.un.org/apps/news/story.asp?NewsID=50403.

First, AQAP focused on growing popular support locally and regionally under a narrative of grievances against the United States and its allies that intruded in Sunni Muslim affairs.[129] Second, AQAP led several jailbreaks that freed inmates from Yemini government prisons in 2011, 2014, and 2015.[130] Finally, AQAP launched Operation Hemorrhage, which conducted numerous small-scale attacks to incur cost over time to adversary governments.[131] For example, Umar Faruk Abdulmutallab cost the United States an estimated $30 billion in additional security measures following the failed December 2009 underwear bombing.[132]

By January 2011, the Arab Spring in Tunisia spread to Yemen.[133] This revolt was exacerbated by almost half of Yemenis living in poverty and a lack of education and health care.[134] Revolts grew after a heavy-handed response to insurgents, and in 2011, President Saleh and dozens of government officials resigned.[135] Afterwards, President Abd Rabbuh Mansur Hadi's election was generally considered positive; however, AQAP and the Houthis continued to organize and leverage tribal groups against the government, eventually taking over the cities of Sanaa and Zinjibar.[136] Ultimately, the Arab Spring in Yemen slowed a restart of public services and highlighted government weakness, which

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[129] Benedict Wilkinson and Jack Barclay, *The Language of Jihad: Narratives and Strategies of Al-Qa'ida in the Arabian Peninsula and UK Responses* (London: Royal United Services Institute for Defence and Security Studies, 2011), 9–19.

[130] Jason Hanna and Hakim Almasmari, "AQAP Freed 6 Fighters from Yemeni Prison, Officials Say," *CNN*, accessed November 15, 2016, http://www.cnn.com/2015/02/13/world/yemen-unrest/index.html; "Yemeni Authorities Were Warned ahead of AQAP Prison Raid: Documents," May 6, 2014, http://www.reuters.com/article/us-yemen-security-insight-idUSBREA4504Y20140506.

[131] Thomas Joscelyn, "AQAP Releases a 'Special Issue' of Inspire Magazine," *The Long War Journal*, November 23, 2010, http://www.longwarjournal.org/archives/2010/11/aqap_releases_a_spec.php.

[132] Atwan, *After Bin Laden*, 102.

[133] Tariq Ramadan, *Islam and the Arab Awakening* (Oxford: Oxford University Press, 2012).

[134] Tom Finn, "Yemenis Take to the Streets Calling for President Saleh to Step Down," *The Guardian*, January 27, 2011, sec. World news, https://www.theguardian.com/world/2011/jan/27/yemen-protests-president-saleh.

[135] Christopher Bueck and Mara Revkin, "The Unraveling of the Salih Regime in Yemen," Combating Terrorism Center at West Point, March 1, 2011, https://www.ctc.usma.edu/posts/the-unraveling-of-the-salih-regime-in-yemen.

[136] Hammoud Mounassar, "Clashes Shatter Yemen Truce, U.S. Slams Killings," *Yahoo*, May 31, 2011, https://www.yahoo.com/fighting-erupts-yemen-capital-071939253.html.

facilitated both Sunni and Shia insurgencies to gain support that led to a coup d'état against President Hadi in 2014.

2. Hypotheses

The political history of Yemen has created a fertile ground to measure political support and opposition for both state and sub-state entities. Therefore, this thesis analyzes the relationship between airstrikes and resulting support for AQAP, Ansar Allah, The Government of Yemen, external states, and overall external extremism from 2012 to 2014.

a. State Legitimacy

First, it may be that airstrikes increase positive sentiment and legitimacy of a state. For example, the United States has a long history of associating sentiment with state power. "Winning hearts and minds" is the theory that popular sentiment strengthens legitimacy in the state.[137] In turn, a state viewed as legitimate gains compliance and support from the populous.[138] This distinction is critical when the goal is not military conquest but influence of the local population. It is possible that in Yemen, airstrikes demonstrated a state's ability to be undeterred from terrorist actions and to continue functioning despite violence. These airstrikes may have been effective when limiting collateral damage or resolving local level grievances with insurgents. In this way, belief in the legitimacy of the state could increase in locations with higher levels of airstrikes.

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[137] Becky L. Lapidow, "Winning Hearts and Minds—Eagle Style," *Engineer* 37, no. 1 (March 2007): 35–36.

[138] Andrew Beath, Fotini Christia, and Ruben Enikolopov, *Winning Hearts and Minds through Development Aid: Evidence from a Field Experiment in Afghanistan* (Moscow, Russia: Center for Economic and Financial Research (CEFIR), 2011), https://ideas.repec.org/p/cfr/cefirw/w0166.html; Nicholas Sambanis, Jonah Schulhofer-Wohl, and Moses Shayo, "Parochialism as a Central Challenge in Counterinsurgency," *Science* 336, no. 6083 (May 18, 2012): 805–8, doi: 10.1126/science.1222304.

Growing literature also suggests state strength is a key deterrent of civil conflict.[139] The greater the ability of the state to monopolize violence, the more a populous would feel free to provide information regarding the insurgents, believing the state could inhibit terrorist actions. State power is theoretically complementary, but necessarily separate from state legitimacy. For example, in Syria, the Assad and Putin regime airstrikes against civilians were meant to quell an insurgency by showing the overwhelming power of the state.[140] Civilians may not view the state as legitimate, but may capitulate to the state for safety. Yemen airstrikes could have demonstrated a way to ensure freedom from intimidation for civilians, and as such, raise popular support.

Hypothesis 1a: All else equal, regions experiencing recent airstrikes are more likely to experience subsequent increases in support for the Yemeni state.

Conversely, airstrikes may decrease support for the local state. This possibility can result for two reasons. First, in the event of civilian casualties, it may increase local level grievances against the state. In Yemen, it was seen most recently by the airstrikes on a town hall by Saudi Arabia, killing over 140 people.[141] It is possible that these civilian casualties resulted in desires for revenge and decreased pro-state sentiment.[142]

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[139] Katherine Barbieri and Rafael Reuveny, "Economic Globalization and Civil War," *Journal of Politics* 67, no. 4 (November 1, 2005): 1228–47, doi: 10.1111/j.1468-2508.2005.00358.x; Katherine Barbieri, *The Liberal Illusion: Does Trade Promote Peace?* (Ann Arbor: University of Michigan Press, 2005); Kristian Skrede Gleditsch, "Transnational Dimensions of Civil War," *Journal of Peace Research* 44, no. 3 (May 1, 2007): 293–309, doi: 10.1177/0022343307076637; Hanne Fjelde and Indra De Soysa, "Coercion, Co-Optation, or Cooperation? State Capacity and the Risk of Civil War, 1961—2004 *," *Conflict Management and Peace Science* 26, no. 1 (February 1, 2009): 5–25, doi: 10.1177/073889420 8097664; Cullen S. Hendrix, "Measuring State Capacity: Theoretical and Empirical Implications for the Study of Civil Conflict," *Journal of Peace Research* 47, no. 3 (May 1, 2010): 273–85, doi: 10.1177/00223 43310361838; Bethany Lacina, "Explaining the Severity of Civil Wars," *Journal of Conflict Resolution* 50, no. 2 (April 1, 2006): 276–89, doi: 10.1177/0022002705284828; Cameron G. Thies, "Of Rulers, Rebels, and Revenue: State Capacity, Civil War Onset, and Primary Commodities," *Journal of Peace Research* 47, no. 3 (May 1, 2010): 321–32, doi: 10.1177/0022343310361841; Warren, "Explosive Connections? Mass Media, Social Media, and the Geography of Collective Violence in African States"; T. Camber Warren, "Not by the Sword Alone: Soft Power, Mass Media, and the Production of State Sovereignty," *International Organization* 68, no. 01 (January 2014): 111–41, doi: 10.1017/S0020818313000 350.

[140] Gutman, "Assad and Putin's Sick Strategy Bombing Hospitals."

[141] Associated Press, "Saudi-Led Airstrike Kills over 140 Mourners in Yemen," *New York Post*, October 9, 2016, http://nypost.com/2016/10/08/saudi-led-airstrike-kills-over-140-mourners-in-yemen/.

[142] Luke N. Condra et al., *The Effect of Civilian Casualties in Afghanistan and Iraq* (Cambridge, MA: National Bureau of Economic Research, 2010), 6, http://www.nber.org/papers/w16152.

Second, with a prolonged campaign, such as in Yemen, it is possible that the warfighting cost for the state would decrease the ability of the state to handle economic and humanitarian issues, thus decreasing popular support.[143] The World Bank reports that nearly 21.1 million people in Yemen have been directly affected by the conflict, with 6.5 million being displaced.[144] The displaced citizens could cause further stress upon a country already living in 80% poverty, and as such, decrease state support.

Hypothesis 1b: All else equal, regions experiencing recent airstrikes are more likely to experience subsequent downturns in support for the Yemeni state.

b.   *Insurgent Sentiment*

It is also possible that public support for insurgencies would grow in response to airstrikes. First, if the insurgents see an airstrike as the state extending its power in a given geographic area, insurgencies may focus on this area to control public sentiment and maintain their reputation.[145] In Yemen, ex-President Saleh attempted to use an airstrike as a rallying call for civilians to attack Saudi Arabia.[146] Casting a pro-insurgent narrative in these locations as a response to state power may use civilian casualty grievances—whether real or fabricated—to increase recruitment. Therefore, in Yemen, it is possible that the increased focus of information operations in these locations could result in a higher level of support for the insurgents.

Second, insurgents may attempt to coerce the population using fear in a given geographic area, thus forcefully increasing insurgent support. In Yemen, al-Qaeda often

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[143] Paul Collier and Anke Hoeffler, "Greed and Grievance in Civil War," *Oxford Economic Papers* 56, no. 4 (October 1, 2004): 563–95, doi: 10.1093/oep/gpf064; Fjelde and Soysa, "Coercion, Co-Optation, or Cooperation?"; Hendrix, "Measuring State Capacity"; David Sobek, "Masters of Their Domains: The Role of State Capacity in Civil Wars," *Journal of Peace Research* 47, no. 3 (May 1, 2010): 267–71, doi: 10.1177/0022343310362295.

[144] "By the Numbers: The Cost of War & Peace in the Middle East," February 3, 2016, http://www.worldbank.org/en/news/feature/2016/02/03/by-the-numbers-the-cost-of-war-and-peace-in-mena.

[145] Lyall, "Bombing to Lose? Airpower and the Dynamics of Coercion in Counterinsurgency Wars," 38–39.

[146] Noah Browning, "Yemen Ex-President Urges Attack on Saudi Arabia after Air Strike," *Reuters*, October 9, 2016, http://www.reuters.com/article/us-yemen-security-saleh-idUSKCN1290G8.

used this tactic to dissuade locals from supporting the state or Houthi rebels.[147] Theoretically, locations with higher levels of airstrikes would then be areas where the insurgents would be more likely to retaliate with terrorist attacks due to reputational concerns.[148] In turn, this retaliation would deter disloyalty from the insurgent group increasing popular support. More specifically, civilians would then have a vested interest in pro-insurgent loyalty because it would decrease their susceptibility to attack.[149]

Hypothesis 2a: All else equal, regions experiencing recent airstrikes are more likely to experience increases in support for al-Qaeda and Ansar Allah.

In contrast, air strikes may decrease support for insurgencies by showing the insurgency to be weak against the state in the following ways. (1) Leadership decapitation and a systemic network attack may lead to decreased recruiting and a reduction in the ability to operate in a cohesive manner; therefore, less public support for the insurgency. (2) A degradation of networks could cause a loss of skilled labor for the insurgencies, and as such, an inability to fulfill promises to the local population. A lack of promises could lead to a decrease in public support. In addition, if the area was suffering a suppression of support for the state, network targeting could theoretically free up civilians to decrease their support for insurgents.

Hypothesis 2b: All else equal, regions experiencing recent airstrikes are more likely to experience decreases in support for al-Qaeda and Ansar Allah.

Finally, evidence suggests that insurgents are prolific at casting a narrative in response to military action, particularly those insurgents with access to mass media.[150] In these cases, airstrikes would be manipulated to serve external extremist groups and decrease support for external states. The ability to build a global defensive narrative

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[147] "Qaeda Insurgents Kill 18 Houthis as Yemen Sectarian Conflict Spreads," October 20, 2014, http://www.reuters.com/article/yemen-crisis-fighting-idUSL6N0SF3JH20141020.

[148] Lyall, "Bombing to Lose? Airpower and the Dynamics of Coercion in Counterinsurgency Wars," 38.

[149] Stathis N. Kalyvas, *The Logic of Violence in Civil War*, 1st ed. (Cambridge; New York: Cambridge University Press, 2006), 173–209; Audrey Kurth Cronin, "Why Drones Fail," Foreign Affairs, 54, July 1, 2013, https://www.foreignaffairs.com/articles/somalia/2013-06-11/why-drones-fail.

[150] Rid and Hecker, *War 2.0*, viii.

against an adversary is a way to bridge social groups and build a social base. In this way, locations with higher levels of airstrikes could be associated with an increase in support for external extremism, but a decrease in support for external states.

Hypothesis 3: All else equal, regions experiencing recent airstrikes are more likely to experience decreases in support for external states.

Hypothesis 4: All else equal, regions experiencing recent airstrikes are more likely to experience increases in support for external extremism.

B.   STATISTICAL STRATEGY

This chapter utilizes 2D kernel density estimates to generate smoothed "heatmaps" as approximations of regions where higher and lower levels of airstrikes exist. Importantly, kernel density estimates allow for nonparametric statistics inferring density information based on bandwidths associated with a Gaussian distribution of variation in point locations. However, as is the case with airstrikes, there is a lack of data to suggest a consistent bandwidth selection. More specifically, it is not clear what assumptions should be made about the distances over which airstrike effects are likely to be observed, so it is not clear how much "smoothing" should be applied to the point locations. Standard bandwidth selection techniques—such as the mean integrated squared error—relies on a common distribution. However, it would be a mistake to assume a common distribution of airstrike effects, particularly in a military engagement, primarily because effects are likely to occur over multiple distances. Therefore, for each variable this thesis builds several rasters using varying bandwidths for the density estimates. These bandwidths have been selected at the 0.01, 0.05, 0.1, 0.5, 1, and 5 degrees of latitude and longitude to cover the range of possible airstrike effects. The independent variable is then generated by calculating the average density at each location across all bandwidths.

Airstrike measurements were obtained from the newly compiled dataset described in Chapter II, which coded events from the New American Foundation's dataset on airstrikes[151] and the International Bureau of Investigative Journalism. Importantly, this data aggregates all airstrikes regardless of nationality dropping the munition. This is primarily due to a lack of confidence in the accuracy of information regarding the originator of the strike due to the open-source collection methods.

Additionally, the models reported as follow include controls for economic status, population density, power relations, and prior levels of airstrikes. By controlling directly for economic status, it is possible to account for populations who may have harbored negative sentiment toward the state due to poverty. Power relations controls for populations that may have harbored negative sentiment toward the state due to a negative correlation with power disparities. Population density has been correlated with an increase in political violence; therefore, it must be accounted for to ensure the effects of airstrikes are measured in isolation. Finally, prior level of violence within an area, such as airstrikes must be accounted for; therefore, a control for the density of airstrikes over the previous five years is included.

Figure 5 shows a visual summary of the GRAP Yemen data, with measurement locations given by blue dots. Figure 6 displays the estimated density of airstrike events in Yemen by displaying higher levels of airstrikes in deeper levels of red, whereas lower incidences are shown in yellow and then white. Airstrikes in Yemen showed higher density in the central and western portion of the country, whereas the eastern portion of the country displays a lower level of density.

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[151] "Covert Drone War Archives"; "World of Drones," accessed September 25, 2016, http://security data.newamerica.net/world-drones.html.
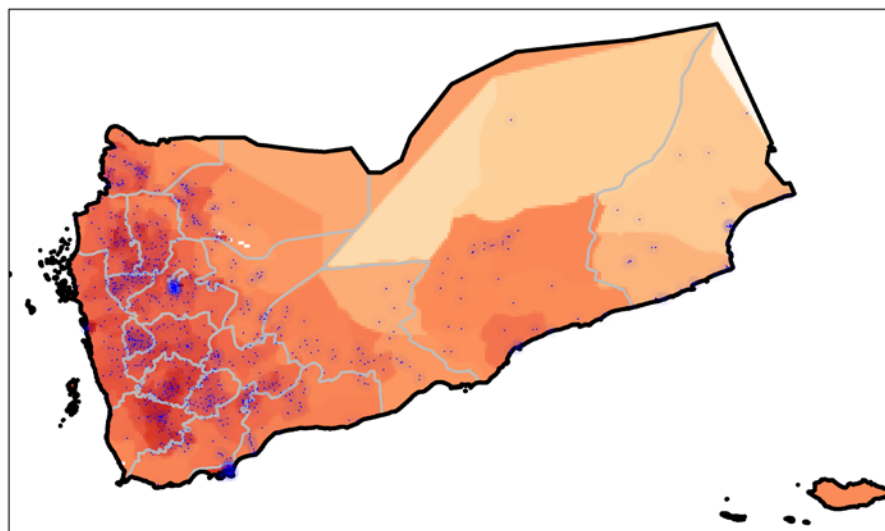
Figure 5. Yemen GRAP Locations November 2013–January 2014
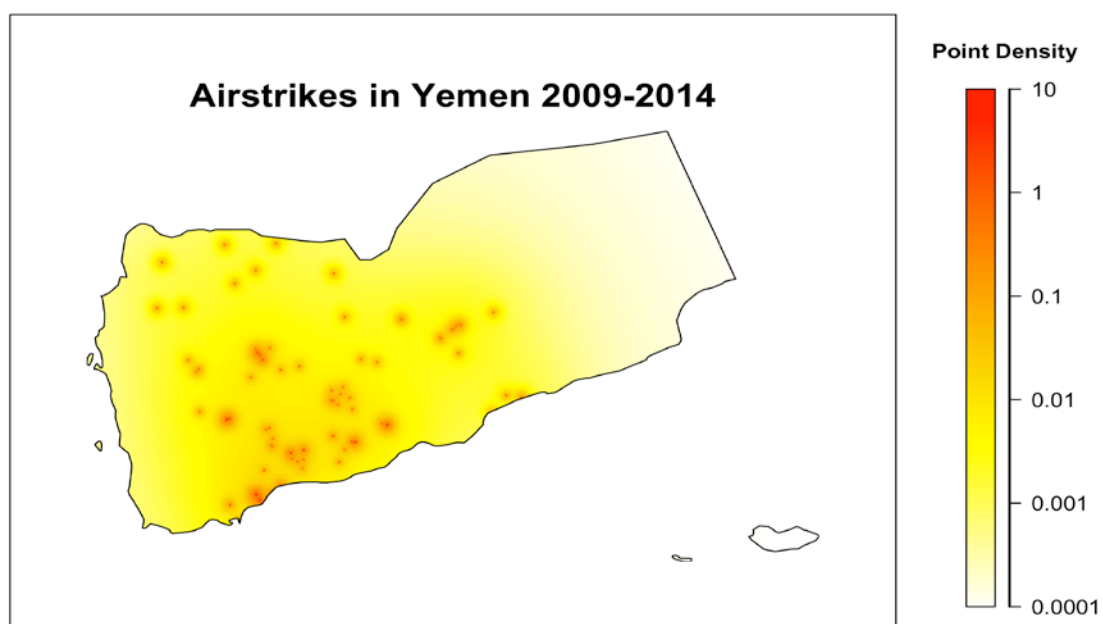
Figure 6. Airstrikes in Yemen from January 2009–January 2014

C.   STATISTICAL RESULTS

This chapter uses a multivariate regression models to assess the relationship between airstrike density and popular support for various political entities in Yemen. Importantly, the dependent variable is reduced from a Likert-type scale giving four possibilities to a dichotomous measure indicating "extreme" support. Because the dependent variable is dichotomous, I utilize logistic regressions to assess the effects. The results from these models are reported in Table 8. Ultimately, the regressions in Table 8 show that differences in levels of support for political entities can be powerfully influenced by airstrike events. Figure 7 displays these results graphically, showing the effect of airstrike density on the expected levels of support for different political entities.

Table 8.   Airstrikes and Sentiment Models Measured in January 2014

	Dependent variable:					
	Government of Yemen (1)	al-Qaeda (AQAP) (2)	al-Sharia (AQAP umbrella) (3)	Ansar Allah (Houthi) (4)	Pro-violent Participation (5)	Western Governments (6)
Airstrike Density (2009-2014)	0.774*** (0.280)	0.562*** (0.112)	1.267*** (0.172)	0.156** (0.074)	1.245*** (0.364)	0.818*** (0.205)
Prior Airstrike D. (2002-2009)	1,588.158*** (242.689)	-0.086 (0.106)	-0.157 (0.120)	0.105 (0.112)	169.211* (95.545)	1,666.524*** (181.005)
Population Density	0.00002 (0.00005)	0.00000 (0.00001)	-0.00000 (0.00001)	-0.00002 (0.00001)	0.00002 (0.00003)	0.0001 (0.0001)
Ethnic Power	0.103 (0.084)	0.154*** (0.045)	0.051 (0.043)	0.859*** (0.044)	0.064 (0.072)	0.116* (0.062)
Wealth	0.073*** (0.017)	0.027*** (0.010)	-0.092*** (0.010)	-0.039*** (0.010)	0.064*** (0.016)	0.020 (0.013)
Constant	1.768*** (0.073)	0.408*** (0.042)	0.386*** (0.041)	-0.227*** (0.041)	1.830*** (0.067)	1.065*** (0.058)
Observations	9,020	9,020	9,020	9,020	9,020	9,020
Log Likelihood	-2,607.496	-5,860.902	-6,107.559	-6,044.017	-3,018.253	-4,106.991
Akaike Inf. Crit.	5,226.993	11,733.800	12,227.120	12,100.030	6,048.506	8,225.983

Note: *p<0.1; **p<0.05; ***p<0.01
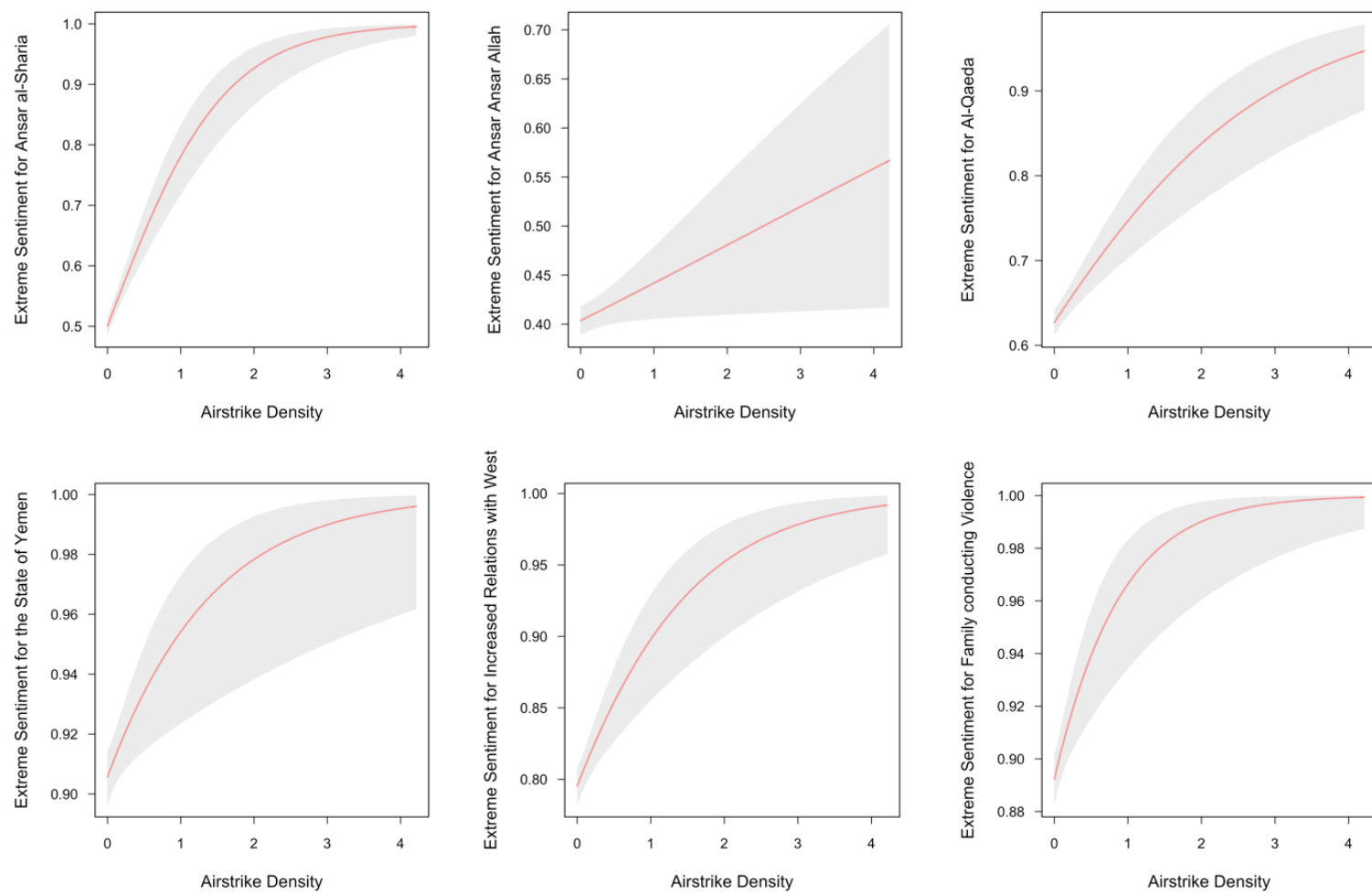
Figure 7.   Airstrikes and Sentiment Substantive Effect Measured in January 2014

Results shown in Table 8 display statistically significant positive relationships between airstrikes and support for both Sunni and Shia insurgencies in Yemen. In particular, AQAPs umbrella organization al-Sharia, shows large increases in support with a coefficient significant at the 99% confidence level. The Houthi insurgency, Ansar Allah, is additionally associated with a positive relationship between airstrikes and extreme support, which is statistically significant at the 95% confidence level. Furthermore, when assessing substantive effects, it can been seen in Figure 7 that support for Ansar al-Sharia is expected to increase by two-fold when shifting from the minimum to the maximum observed values of airstrike density. In contrast, support for the state of Yemen increases is expected to increase by only 10% under the same circumstance.

However, in seemingly conflicting results, it also appears that airstrikes are associated with increased confidence in the national government, a finding that is also significant at the 99% confidence level. In addition, the results show positive associations between airstrikes and support for Western states, such as Germany, France, and the United States, again the case with 99% confidence. However, these results only appear to be conflicting if it is assumed that sentiment is a zero sum game. Instead, these finding suggest that as airstrike density increases, extreme support both for both sides can increase at the same time.

To assess the robustness of these findings, Table 9 and Figure 8 show additional models with dependent variables defined by levels of support for further entities, including specific external states. Consistent with previous models, the findings indicate that airstrikes are associated with greater support for external extremism, at the 99% confidence level. Confidence in Yemeni government institutions is negatively associated within higher airstrike density locations again at a greater than 99% confidence level. In addition, support for external states, such as Iran, Saudi Arabia, and the United Kingdom, are negatively associated with areas of higher airstrike density measurements. Finally, support for the external state of Qatar is positively associated with higher levels of airstrike density at the 99% confidence level.

Table 9.   Measurements of Sentiment for Yemen, External States, and Extremism

	Institutional Confidence in Yemen (1)	Qatar (2)	Iran (3)	United States (4)	Saudi Arabia (5)	United Kingdom (6)	Universal Extremism (7)
				Dependent variable:			
Airstrike Density (2009-2014)	-0.686*** (0.109)	0.171** (0.086)	-0.654*** (0.115)	-0.025 (0.073)	-0.136* (0.073)	-0.279*** (0.080)	0.486*** (0.086)
Prior Airstrike D. (2002-2009)	0.114 (0.098)	-0.132 (0.099)	-0.064 (0.103)	-0.001 (0.097)	-0.149 (0.098)	0.077 (0.102)	-0.291*** (0.097)
Population Density	0.00000 (0.00001)	0.00000 (0.00002)	-0.00002 (0.00002)	-0.00001 (0.00002)	-0.00001 (0.00002)	-0.00001 (0.00002)	0.00004** (0.00002)
Ethnic Power	0.620*** (0.044)	-0.321*** (0.047)	0.853*** (0.048)	0.151*** (0.046)	-0.136*** (0.045)	0.480*** (0.049)	0.444*** (0.043)
Wealth	0.011 (0.010)	-0.141*** (0.011)	-0.108*** (0.011)	-0.054*** (0.010)	-0.122*** (0.010)	-0.150*** (0.011)	-0.092*** (0.010)
Constant	-0.312*** (0.042)	1.038*** (0.046)	-0.319*** (0.044)	0.120*** (0.042)	0.565*** (0.043)	0.229*** (0.044)	-0.101** (0.041)
Observations	8,678	7,931	7,787	7,885	8,241	7,196	9,010
Log Likelihood	-5,881.389	-5,162.217	-5,076.539	-5,446.799	-5,615.365	-4,850.259	-6,101.467
Akaike Inf. Crit.	11,774.780	10,336.430	10,165.080	10,905.600	11,242.730	9,712.517	12,214.930

Note: *p<0.1; **p<0.05; ***p<0.01
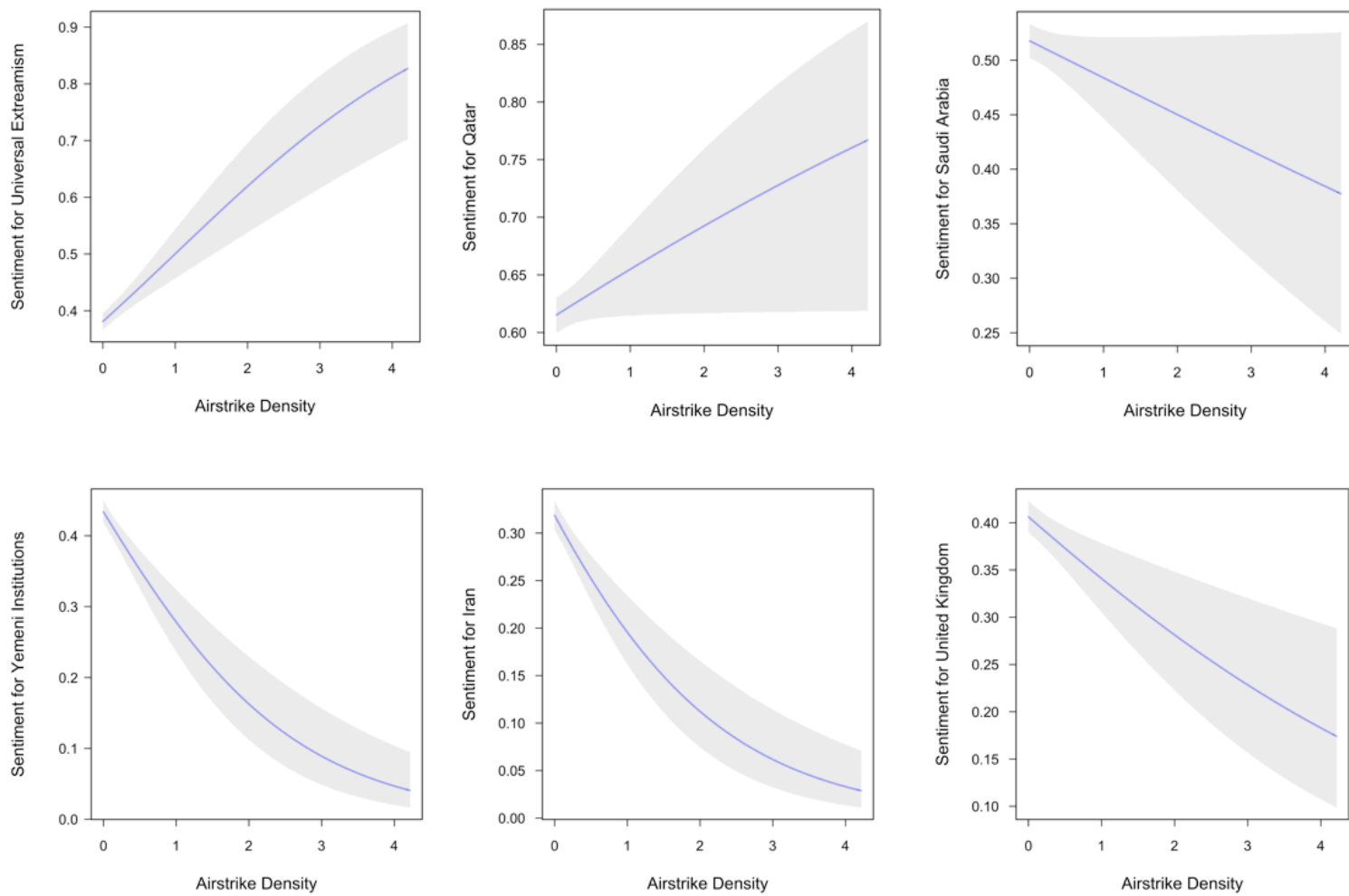
Figure 8.   Substantive Effects for Yemen, External States, and Extremism

Two important conflicts arise from these models. First, the negative relationship between airstrikes and confidence in Yemeni governmental institutions stands in contrast to the positive relationship between airstrikes and support for the Yemeni state. This contrast suggests that airstrike density may highlight socio-economic grievances, such as a lack of belief in the ability of institutional apparatus to handle insurgencies. In addition, it also suggests that while airstrikes may pull from socio-economic grievances, a separate mechanism potentially exists that is taking the political opportunity of an airstrike and pulling civilians to extreme support for the state or insurgency. Narratives, or the ability to frame the political opportunity, are the most likely avenue of transitioning socio-economic grievances through political opportunities.

Second, differences arise between negative associations with support for the United Kingdom, and the United States and aforementioned positive associations with support for "western governments." In this case, the negative coefficients for the United Kingdom and Iran suggest that Yemeni civilians have long-standing socio-economic grievances surrounding historical external intervention. As stated previously, these findings suggest that the political opportunity of airstrikes is not only subject to a given narrative, but also subject to prior social situations, such as historical resentment. Interestingly, sentiment for the United States is not associated positively or negatively with airstrike density at standard levels of statistical significance.

C.   DISCUSSION AND INTERIM CONCLUSIONS

The results from the models reported above provide substantial support for Hypothesis 1a, which predicted that regions experiencing recent airstrikes would be more likely to experience subsequent increases in support for the Yemeni state. It should be noted, however, that the historical relevance of government corruption in Yemen suggest that regions experiencing airstrikes are additionally subject to uncovering dissatisfaction with government institutions. This suggests a broad mechanism of airstrike effects driven by transitioning populations from bystanders to participants in the political process.

The findings in this chapter also supports Hypothesis 2a, which predicted that regions experiencing recent airstrikes would be more likely to experience increases in

support for al-Qaeda and Ansar Allah. Intriguingly, although each of the Yemeni insurgencies have shown positive associations, those insurgencies with higher local-level focuses—such as al-Sharia—appear able to generate greater increases in support in response to local airstrike events. This suggests that public support in Yemen may be best garnered by focusing on information operations at the local town level, even for a multinational insurgency, such as al-Qaeda. Finally, the data presented in this study suggests support for Hypothesis 4, which predicted that regions experiencing recent airstrikes would be more likely to experience increases in support for external extremism.

In contrast to both grievance and power-based explanations, this evidence suggests that an information centric argument has the best power to explain the relationship between airstrikes and political support. Instead of assuming that airstrikes demand a particular response from civilians, it is more likely that airstrikes are subject to information distribution regarding their causes and effects. In this way, airstrike effects are *amoral*, not predetermined to either support or detract from sentiment for or against a state. Within Yemen, and elsewhere, it is likely that airstrikes are drawing upon prior socio-economic grievances and being utilized as a political opportunity using a narrative. This being said, within a given socio-economic landscape additional measurements are needed to assess how sentiment is mobilized into political violence. If the theory of information distribution using the political opportunity of an airstrike is accurate, the resultant political violence may exist in areas where information asymmetry, or the narrative, is not dominated by the state.

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IV.   CONCLUSION

The evidence presented in this thesis supports the theory that in irregular warfare, locations with higher airstrike density associate with measurable effects on civilian sentiment and political violence. The importance of these effects will deepen in consequence as the number of non-state actors and protracted wars increase.[152] Two major findings emerge from this statistical analysis. First, airstrikes have a sentiment-intensifying effect, which moves bystanders to become participants in the political process. Second, airstrike effects are dependent on socio-economic contexts and are, therefore, subject to variation in narrative distribution. These effects most closely align with the theory of information asymmetry.

A.   FIRST FINDING: AIRSTRIKES AS INTENSIFIERS OF EXTREMISM

Airstrikes as measured in this thesis appear to have a systematically polarizing effect on civilian populations. These findings contrast revenge-based accounts that generally espouse airstrikes are responsible for negative civilian sentiment against state entities.[153] Instead, these findings lend support to information-based accounts explaining civilian responses to airstrikes.[154] By extending information-based theories to airstrikes, this thesis suggests kinetic events are amoral tools to create narratives and mobilize popular sentiment.[155] Surprisingly, as opposed to supporting studies which show one sided effects of kinetic events and sentiment, this thesis shows airstrikes are associated with stronger support for *all* political entities within a given space. Subsequently, the

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[152] For more information on the logical consistency of using non-state actors in modern warfare, see Zeev Maoz and Belgin San-Akca, "Rivalry and State Support of Non-State Armed Groups (NAGs), 1946–2001," *International Studies Quarterly* 56, no. 4 (December 1, 2012): 720–34, doi: 10.1111/j.1468-2478. 2012.00759.x.

[153] Condra et al., *The Effect of Civilian Casualties in Afghanistan and Iraq*, 32–34.

[154] Ibid., 6.

[155] Secretary of Defense Robert Gates expresses concern that civilian casualties being caused by airstrikes are playing into the hands of insurgents. He calls for a renewed look at how operations are conducted to ensure local level sentiment is accounted for in these situations. For more, see Heather Mayer, "Gates Calls Afghanistan 'Greatest Military Challenge,'" RadioFreeEurope/RadioLiberty, January 28, 2009, http://www.rferl.org/a/Defense_Chief_Calls_Afghanistan_Greatest_Military_Challenge_For_US/13 75703.html.

airstrike accelerated bystander-to-participant process, as shown in Chapter III, aligns more closely with radicalization theories that espouse a mixture of both ideology and social factors.[156] Although this process can take place without airstrikes, the kinetic event itself hastens the bystander's building of a conceptual framework to rationalize political violence. Figure 9 depicts the bystander-to-participant process wherein an airstrike gives the basis for narratives, bias, and social cues that transform into extreme support for a political entity.
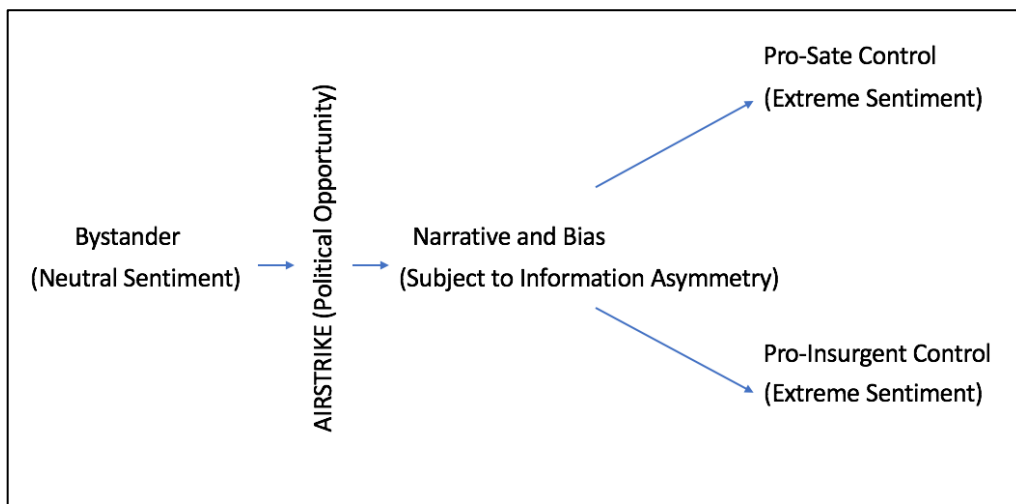

Figure 9. Bystander to Participant Using Airstrikes as Political Opportunities.

In addition to the increase in extremist sentiment, airstrikes also seem to draw on past social grievances to frame the political opportunity prior to narrative distribution. These findings help sharpen the debate on mobilization and sustainment theories, which fall generally into three camps. First, the classical theory of insurgent mobilization holds that disenfranchised individuals within society develop disruptive psychological states that drive participation in social movements.[157] Social angst, as described with classical theory, may indeed result in individual dissonance; however, the positive views of the

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[156] Scott Helfstein, *Edges of Radicalization: Ideas, Individuals and Networks in Violent Extremism* (West Point: U.S. Military Academy, Combating Terrorism Center, 2012).

[157] Doug McAdam, *Political Process and the Development of Black Insurgency, 1930–1970*, 2nd ed. (Chicago: The University Of Chicago Press, 1999), 7.

Yemeni government in areas with higher state violence suggest further mechanisms are at play.[158] In contrast to classical mobilization, resource mobilization theory suggests insurgents are motivated by grievances related to a lack of access to political systems.[159] As stated previously, grievances are seen as a baseline for airstrike framing, but they cannot wholly explain the findings within this thesis. In particular, civilians displayed both a decrease in state institutional confidence, and an increase in extreme support for the state of Yemen. Therefore, the most likely theory that aligns with the data presented in this thesis is the political process model. The political process model advances the idea that socio-economic conditions form a basis for expanding political opportunities and drive social framing and recruitment.[160] Inherent to this theory is the importance of core narratives that offer alignment and bridging between disparate social groups.[161] Using this foundational idea, the models within this thesis indicate that within areas of higher airstrike density, narrative frame alignment, bridging, and extension possibilities increase. Therefore, it is most likely that airstrike effects as a political opportunity are available for state or insurgent mobilization.

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[158] For classical mobilization theories, reference Neil J. Smelser, *Theory of Collective Behavior* (New York: Free Press, 1965), http://archive.org/details/theoryofcollecti00smel; William Kornhouser, *The Politics of Mass Society*, rev. ed. (New Brunswick, NJ: Transaction Publishers, 2008); Edward O. Laumann and David R. Segal, "Status Inconsistency and Ethnoreligious Group Membership as Determinants of Social Participation and Political Attitudes," *American Journal of Sociology*, 1971.

[159] John D. McCarthy and Mayer N. Zald, "Resource Mobilization and Social Movements: A Partial Theory," *American Journal of Sociology* 82, no. 6 (1977): 1212–41; Adrian F. Aveni, "Organizational Linkages and Resource Mobilization: The Significance of Linkage Strength and Breadth," *The Sociological Quarterly* 19, no. 2 (1978): 185–202; Albert Breton and Raymond Breton, "An Economic Theory of Social Movements," *The American Economic Review* 59, no. 2 (1969): 198–205; J. Craig Jenkins and Charles Perrow, "Insurgency of the Powerless: Farm Worker Movements (1946–1972)," *American Sociological Review* 42, no. 2 (1977): 249–68, doi: 10.2307/2094604; Nathan Constantin Leites and Charles Wolf, *Rebellion and Authority: An Analytic Essay on Insurgent Conflicts* (Santa Monica: RAND, 1970), http://www.rand.org/pubs/reports/R0462.html.

[160] Doowan Lee, "A Social Movement Approach to Unconventional Warfare," *Special Warfare*, September 2013; McAdam, *Political Process and the Development of Black Insurgency, 1930–1970*; Doowan Lee and Glenn W. Johnson, "Revisiting the Social Movement Approach to Unconventional Warfare," *Small Wars Journal*, December 1, 2014, http://smallwarsjournal.com/jrnl/art/revisiting-the-social-movoment-appproach-to-unconventional-warfare.

[161] Belinda Robnett, "Emotional Resonance, Social Location, and Strategic Framing," *Sociological Focus* 37, no. 3 (August 1, 2004): 195–212, doi: 10.1080/00380237.2004.10571242; Quintan Wiktorowicz, "Framing Jihad: Intramovement Framing Contests and Al-Qaeda's Struggle for Sacred Authority," *International Review of Social History* 49, no. S12 (2004): 159–77, doi: 10.1017/S0020859004001683; David A. Snow et al., "Frame Alignment Processes, Micromobilization, and Movement Participation," *American Sociological Review* 51, no. 4 (1986): 464–81, doi: 10.2307/2095581.

B.   SECOND FINDING: AIRSTRIKES AND INFORMATION ASYMMETRY

The statistical models presented here also support the proposition that airstrike effects are driven by forces similar to those seen in the economic theory of information asymmetry.[162] In this way, airstrikes may be akin to making the product of state violence available to individuals with limited accessibility prior to the kinetic event. This theory extension has the following three implications.

First, increasing information disclosure or decreasing information asymmetry may subsequently increase buy-in to the state's political message upon the execution of violence. If rational actors do indeed choose between good and bad interpretations of airstrikes, increasing the information disclosure on a good product should theoretically increase the buy-in of that product. Often, this requires information "intermediaries" who are skilled at presenting information to the investor.[163] For state actions, this is akin to military information support to operations (MISO) as experts in delivering information to the civilian population.

Second, issues naturally arise with airstrike information disclosure, as not all airstrikes are effective in destroying only the intended target. George Akerlof describes this issue as the "lemon problem," in which the product itself is never guaranteed completely beneficial.[164] Therefore, not only do military airstrikes contend with manipulation by insurgent narratives; they also rely on the ability of those strikes to hit the intended target while avoiding civilian casualties. In addition, there is a tendency for entrepreneurs to overstate their causes either to make their products more believable or to retain investors.[165] The loss of trust and anti-state sentiment could result if an investor uncovers false information from the entrepreneur. Therefore, MISO must ensure that honesty is involved when interpreting state violence for public consumption.

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[162] For an overview of information asymmetry and the foundational concepts of the theory, reference Healy and Palepu, "Information Asymmetry, Corporate Disclosure, and the Capital Markets."

[163] Healy and Palepu, "Information Asymmetry, Corporate Disclosure, and the Capital Markets," 406.

[164] The seminal work on disclosure of product quality that lays the foundation for information asymmetry is George A. Akerlof, "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism," *The Quarterly Journal of Economics* 84, no. 3 (1970): 488–500, doi: 10.2307/1879431.

[165] Healy and Palepu, "Information Asymmetry, Corporate Disclosure, and the Capital Markets," 408–410.

Finally, investment in a product allows an entrepreneur the ability to manage that investment to benefit the company. When civilians trust a state to use violence, or interpret violence by giving extreme support for the state, they are investing in the state. This is a critical component of controlling a population, as prior research suggests that civilian belief in the state monopoly of violence keeps revolutions at bay.[166] Information disclosure would then suggest that civilians expect a portion of compensation for their political buy-in. For airstrikes, or follow-on military action, this could mean ensuring local-level issues are addressed as compensation for the individual's belief in the state's use of force.

C.   CONCLUSION

It is important to note that the cases considered in this thesis focused on the secondary effects of airpower in limited irregular conflicts. These limited irregular airpower campaigns are fundamentally different from campaigns seeking the submission of a population through indiscriminant violence. Indiscriminant violence studies have shown that in circumstances such as the Russian artillery barrages in Grozny, domination over the civilian population may decrease political violence.[167] However, short of overwhelming force, the human domain within irregular warfare allows for the exploitation of airstrikes through narratives and the mobilization of violence. As a process, the destruction of equipment—or militants—is only the first step in accomplishing policy goals. This destruction, in limited irregular warfare, is followed naturally by human interpretation, either acceptance or rejection, of the intended message. Although the human domain is not unique to limited irregular warfare, the basic premise of controlling a population elevates the interpretation of airstrikes to strategic importance. Moreover, the evidence seen here indicates that this "purchase" or rejection of the intended interpretation is dependent in large part on the level of information asymmetry available to the population or investor.

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[166] Chalmers Johnson, *Revolutionary Change*, 2nd ed. (Stanford, CA: Stanford University Press, 1982), 100.

[167] McAdam, *Political Process and the Development of Black Insurgency, 1930–1970.*

Kinetic airstrike events not only have effects that span campaigns but also include effects specific to individual events. In limited irregular warfare, political violence and extreme sentiment are subject to human bias, socioeconomic grievances, and narratives. States must compete with insurgents for this information space in the same manner companies compete for potential investors. Because information dissemination techniques are readily accessible in today's information age, the smaller the political entity, the faster the information may be disseminated. Therefore, government leaders must think deeply about their information dissemination techniques to lower the information asymmetry between the state and the population. As shown in this thesis, when using disseminating information, states should account for the sentiment-increasing effects of kinetic airstrikes.

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